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March 31, 2014

Subject: Springfield Water and Sewer Commission Annual CSO Report and Inflow and Infiltration and Information

To Whom It May Concern:

Pursuant to NPDES Permit No. MA0103331 attached please find the 2013 CSO Annual Report for the Springfield Water and Sewer Commission as well as the Inflow and Infiltration information for the Springfield Regional Wastewater Treatment Facility.

If you have any questions or comments concerning the attached information please do not hesitate to contact our office at (413) 787-6256.

Respectfully

Springfield Water and Sewer Commission

Katherine J. Pedersen
Executive Director

Cc: Joshua D. Schimmel, Springfield Water and Sewer Commission

NPDES MA0103331
NINE MINIMUM CONTROLS
2013 ANNUAL STATUS REPORT

Introduction

The Springfield Water and Sewer Commission has developed and implemented a series of operating, maintenance and management strategies to minimize the impact of combined sewer overflows and their effects on receiving water quality. These strategies are outlined in the Springfield Water and Sewer Commission Nine Minimum Controls (NMC) Program document dated April 1997 and as updated in April 2010. It is the intent of this report to document the status of those activities conducted by the Springfield Water and Sewer Commission and United Water Environmental Services, Inc. in 2013 and to identify such future activities as are currently under review or planned.

The nine minimum controls and their status are as follows:

1. Proper Operation and Regular Maintenance Programs for the Sewer System and Combined Sewer Overflows

Operation and maintenance of the Commission's CSO program is conducted in accordance with the NPDES Permit and as outlined in the 1997 NMC Report and update as submitted in April 2010. The following details are provided to update the status of several key elements of a proper operations and maintenance program as outlined in the May 1995 USEPA Combined Sewer Overflows Guidance for Nine Minimum Controls. The elements updated include Organizational Responsibility, Resources (operations and maintenance budget), and Periodic Inspection and Maintenance.

A. Organizational Responsibility

The Commission holds the NPDES permit for operation of the CSOs. United Water Environmental Services, Inc. was brought under contract with the Commission in 2001 to conduct operations and maintenance activities for the Springfield Regional Wastewater Treatment Facility (SRWTF), portions of the sewer pump stations and interceptor sewers, and the permitted CSOs. An organizational chart depicting the Commission's collection system maintenance and operations group was submitted in April 2010 and subsequent CMOM submittals.

B. Periodic Inspection and Maintenance

United Water Environmental Services, Inc. performs routine inspections of the CSOs twice-weekly as required in the NPDES permit. Certification has been submitted confirming that inspections for the calendar year 2013 were conducted, results were recorded, and records of the inspections were maintained as part of the annual report required by Part I.A.3 of the NPDES Permit being submitted concurrently with this report.

a. Routine inspection, maintenance, and investigation of the Connecticut River Interceptor Sewer included removal of sediment, monitoring level and velocity in the interceptor line, cleaning of heavy sediment from specific locations in the line, and cleaning the Clinton Street Grit Pit. The full length of the Connecticut River Interceptor is periodically cleaned and then inspected using remote television cameras and sonar. Remote depth and velocity sensors were installed in the interceptor sewer in 2008 to evaluate sediment deposition rates and respond with cleaning before storage and flow is adversely impacted. The grit pit is inspected weekly and grit is removed every 90 days on average. In 2013, the CT River Inceptor was inspected and floatables cleaned from the interceptor per the O&M procedures in Appendix C of the CMOM annual report. 99.39 tons of grit was removed from the Clinton Street Grit Pit during 2013.

b. The Commission has continued to advance its sewer assessment program with continued inventory, cleaning, inspection, and assessment through contracted services. The program also includes GPS locations for inspected assets as well as GIS advancement. This program included inspection of both of the critical Connecticut River sewer crossings. The following is a breakdown of 2013 activities:

GPS Mapping	2080 Manholes
Manhole Assessment (Contract)	2078 Manholes
CCTV Inspection (Contract)	744,354 LF
Cleaning (Contract)	395,630 LF
Cleaning (SWSC)	351,042 LF
Grit Disposal (Contract)	303 Tons
Grit Disposal (SWSC)	1,500 Tons

C. Operations and Maintenance Resources

One of the key elements of a proper operations and maintenance program is allocation of resources. The Commission spent $12,089,861 in 2013 for CSO and sewer related operations, maintenance, and projects that contribute to the CSO system. Expenditures for these activities will continue to expand through FY 2014. In addition, the Commission has systematically upgraded contracted services and in-house capabilities over the past 10 years to improve overall operations and maintenance of the CSO system. The following is a list of activities undertaken in 2013 that demonstrate the Commission's and United Water's commitment to continued operations and maintenance programs:

- The Commission and United Water completed modifications to the permanent flow metering and monitoring system for CSOs in September 2011 and have continuously monitored the metering system to understand its accuracy limitations.
- The Commission has conducted periodic temporary metering programs to validate the permanent metering system and update the Commission's hydraulic model.
- The Commission has contracted numerous pipeline assessment programs including combined sewer collection system assessments through CCTV contractors, high definition video, laser and sonar profile assessments, and zoom camera inspections.
- The Commission has contracted building inspections and confined space inspections to determine and eliminate inflow sources from separated areas that are tributary to combined sewers.
- The Commission and United Water have contracted services to clean the Connecticut River Interceptor (CRI).
- The Commission has contracted hydraulic and water quality modeling assessments for all areas of the combined sewer system and all receiving waters.
- The Commission has contracted services to inspect the CSO regulators in addition to those inspections required by NPDES Permit and conducted by United Water.
- The Commission developed an in-house CCTV and cleaning program which included procurement of a CCTV truck and hiring a CCTV crew, providing training and resources. The Commission uses these resources to perform PACP compliant inspections. The Commission has also upgraded its fleet with the addition of new equipment and vehicles used in the operation and maintenance of the collection system.

- The Commission procured Jet/Vac cleaning equipment and hired staff to perform prioritized cleaning assignments.
- FOG Program Implementation, including staffing, regulation changes, and public education.

D. CMOM Implementation

- The Commission has continued implementation of a system wide CMOM Program that addresses the combined sewer system as well as the separated sewer system. The program included completion of a Self-Assessment Checklist in March 2009, development of a Corrective Action Plan in June 2009 and commitment of resources to address recommended corrective actions in accordance with the agreed upon schedule since that time. In 2010 the Commission and United Water continued to advance the CMOM Program. A 2010 CMOM Program Annual Report summarizing these activities was submitted pursuant to Administrative Consent Order Docket Number 08-037. In 2011 the Commission submitted the 3 year Update to the Self-Assessment Checklist in lieu of the annual report per Administrative Consent Order Docket Number 08-037. The 2013 CMOM Annual Report has been submitted pursuant to Administrative Consent Order Docket Number 08-037.

E. Integrated GIS/Asset Management Program

The Commission has implemented an integrated GIS/Asset Management program to better document the condition of the existing combined sewer system and track maintenance and repair activities.

The program architecture consists of an ArcGIS platform integrated with a SQL Server database and DataStream CMMS application. The Commission has systematically built the GIS database for the critical components of the combined sewer collection system starting with existing record information and updating that with newer field data and as-built records from more recent system improvements. Work orders and maintenance activities, are recorded in the DataStream application.

Condition ratings for components of the combined sewer system that have been gathered through the contracted assessment work and in-house maintenance activities are linked to each asset and readily available to Commission staff and managers for analysis, prioritization, and remedial actions. The system has increased the efficiency with which the Commission can allocate resources and enhanced the combined sewer system's overall performance.

The Commission has advanced the integrated asset management system that considers the condition rating information currently in the GIS and assigns a risk rating to the asset based on probability and consequence of failure with the ultimate goal of developing a more automated approach to prioritizing collection sewer system improvements. The Commission intends to implement these activities as system wide programs for the collection system over time. This methodology has been a cornerstone of the development of the Commission's Integrated Long Term CSO Control Plan which was submitted in 2012 and is being updated for 2014.

The Commission has also advanced a systematic program to convert approximately 25,000 record drawings into a digital archive to be linked to the GIS system being developed and also scanned 36,000 sewer service cards into its electronic database in 2013.

F. Planned Maintenance Activities

United Water Environmental Services, Inc. performs a program of planned and preventative maintenance activities at the pumping stations, and headworks facility to ensure maximization of flows to the wastewater treatment plant.

United Water Environmental Services, Inc. has certified, under separate letter, to the Springfield Water and Sewer Commission that inspections for calendar year 2013 were conducted, results recorded and records maintained.

2. Maximum Use of the Collection System for Storage

A. United Water Environmental Services, Inc. maintains pump station wet well levels to maximize storage in the collection system without causing potential for damage to persons and/or property.

The Springfield Water and Sewer Commission (SWSC) has completed or initiated the following system upgrades to effectively maximize the use of the collection system to minimize CSO impacts:

- System Optimization Measures ($100,000) – This project evaluated the CSO regulators and collection system to identify, design, and implement a series of small scale improvements to the CSO system that would have immediate benefits in reduction of CSO activations and volume. These projects were implemented between 2000 - 2004.
- Mill River CSO Relief Project ($7,000,000) – This project increased in-system capacity upstream of the seven CSOs that discharge to the Mill River with the goal of minimizing discharges from these CSOs to no more than one in a typical year storm series. Key elements included installation of five vortex valve throttling devices and one bending weir. Each of these components regulates flow and maximizes in-system storage prior to discharge from the CSO regulators. An update to the Mill River Project has been submitted.
- Chicopee River CSO Control ($36,000,000) – This project eliminated CSOs 043 and 044 by converting them to storm drain only discharges. It also increased capacity of the combined sewers upstream of the remaining four CSOs that discharge to the Chicopee River with the goal of minimizing discharges from these CSOs to no more than two in a typical year storm series. The project also created 100,000 gallons of CSO storage at the Indian Orchard Pump Station that captures potential CSOs at the site for storms larger than the 5-year return period and eliminated an estimated 700,000 gallons of surface flooding predicted for a typical year storm series at the pump station. The project also created 2,400 linear feet of 24-inch diameter parallel relief for the Ludlow Interceptor and increased capacity of the pump station from 34 mgd to 52.5 mgd, thereby conveying more flow to the SRWTF.
- Phase I Connecticut River CSO Control ($26,000,000) - Construction of sewer and drain improvements upstream of Regulator 007 and 049 were completed in 2012. These improvements will reduce CSO discharges at both regulators through targeted separation, increased conveyance for drain and sewer, and optimization of in system storage. The project also includes a downspout disconnection program that will reduce private property inflow from the combined sewer system.
- Washburn Street CSO Project ($8,000,000) – This project replaced the existing regulator structure and reconfigured the separated drainage system on Riverside Road so that storm flows entered the combined sewer system downstream of the regulator structure which eliminated 5 Million Gallons (MG) of separated storm flow from the system annually. In addition, the flood doors were replaced providing the combined sewer system with enhanced protections from high river inflow.
- A comprehensive cleaning and CCTV program was completed in 2010 that included the cleaning and CCTV of greater than 100,000 feet of sewers. Approximately 50 tons of grit

was removed during this cleaning program. The program was continued in 2011 (see statistics in Section 1.B.b above).

- Development of a final CSO Long Term Control Plan was completed in 2012. This included flow monitoring, cleaning and inspections of infrastructure, GIS development, asset inventory, risk modeling, hydraulic modeling and water quality modeling. CSO abatement technologies and planning level project alternatives were developed and evaluated. These activities improved hydraulic capacities and advanced the understanding of the collection system.
- Phase II Washburn Street CSO designs were completed, the design work included additional flow monitoring, modeling, alternatives analyses and development of final design documents which will optimize use of the collection system to reduce CSO. The Project is under construction at this time with a total cost in excess of $23,000,000. Project completion is anticipated in the summer of 2014.
- CSO 12 and 13 regulator structures were cleaned and evaluated.
- Pump station wet wells were deep cleaned.
- Targeted temporary metering programs were performed in the CT River Interceptor sewershed to support ongoing CSO control design activities and update the hydraulic model.
- The CSO Long Term Control Plan is being updated based on information developed and gathered since the May 2012 submittal of the FLTCP

3. Review and Modification of Pretreatment Requirements to Ensure that CSO Impacts are Minimized

To control the sources of pollutants from industrial dischargers, the Commission administers an Industrial Pretreatment Program (IPP) as outlined in the 1997 NMC Report. This program sets regulations for sewer use and pretreatment permits, conducts inspections of IPP permitted institutions, and prepares a separate IPP Annual Report.

The IPP conducts audits, compliance monitoring inspections, and demand monitoring inspections. The purpose of the audit inspections is to collect and confirm information concerning an industrial user and its regulated processes and to evaluate the industry's compliance with the applicable pretreatment standards and regulations. The IPP is primarily concerned with identifying the wastewater pollutant pathways through the industrial user, evaluating the effectiveness of pretreatment and/or monitoring systems and verifying that residue associated with the removal of wastewater pollutants is disposed of properly.

a. EPA granted approval of local limits in an April 26, 2001 letter, the Springfield Water and Sewer Commission (SWSC) approved these local limits on June 13, 2001 and they were incorporated into the SWSC Rules and Regulations.

b. Detailed information on the SWSC's IPP is included in the IPP Annual Report for 2013 which was recently submitted.

4. Maximize Flow to the Treatment Plant

a. United Water Environmental Services, Inc. follows procedures outlined in the Springfield Water and Sewer Commission High Flow Management Plan to maximize flow to the treatment plant during storm events. The facility has taken flows of 185 MGD and greater into the treatment plant and 134 MGD into the secondary treatment process during the year. Strategies utilized include routine flushing of the 66 inch diameter inlet channels during dry weather to control accumulation of sediments which could restrict hydraulic capacity. Procedures developed and verified in 2006 for improved high flow management continued to be used in 2013. These procedures included implementation of step feed or shutting off air to aeration zones 2 and 3 to allow for the parking of solids in the aeration basins during high flow events to reduce solids loss during periods of peak hydraulic loading in the secondary clarifiers.

b. High flow events that result in influent by-pass are verbally reported within 24 hours and a written report is filed with 5 days pursuant to NPDES requirements. .

c. Recent system upgrades that contribute to maximizing flow to the treatment plant are as follows:

- Remotely operated gate actuators were installed on inlet gates for both the primary and secondary processes in 2008. Remote operation of these gates allows operators to maximize flows through the SRWTF.

- Parallel relief to the Ludlow Interceptor and pumping system upgrades at the Indian Orchard Pump Station were completed in May 2009 increasing the capacity from 34 MGD to 52.5 MGD. This increase in pump capacity affects total volume of wastewater conveyed to the SRWTF without impacting downstream CSOs.

- One electric pump at the York Street pump station was completely reconditioned in 2008 increasing capacity for the pump station. Measured improvement showed a 25% increase in pumping capacity for that pump when compared to output prior to the reconditioning. A second York Street pump was completely reconditioned in 2011.

- Automated bar racks were installed at the York Street pump station in December 2009. This upgrade removes more materials from the wastewater stream that could become downstream obstructions to flow. A similar project was completed at the SRWTF bar screens to optimize flow at the headworks entering the plant.

- The transition to the Washburn Street Pump Station was modified with a larger inlet that connected to a new 30-inch diameter influent pipe to the pump station, upsized from 18-inches that has reduced problematic blockages and maintenance issues from the regulator structure to the wet well. The sanitary pumps were all replaced in 2012.

- New CSO regulator structures with flow control devices and installation of more than 15,000 feet of sewer and drain pipe in the CSO 049 and 007 sewer shed has contributed to minimizing CSO and maximizing flows to the SRWTF.

- Critical sewers crossing the Connecticut River were inspected in 2011 and data analyzed in 2012 to determine structural condition and assess operational and maintenance issues.

5. Elimination of CSOs During Dry Weather

In accordance with Part I.A.2.c of the NPDES Permit, the Commission reports any dry weather CSO discharges within 24 hours and provides written follow-up identifying durations, estimated volumes, and results of investigations. Efforts to eliminate dry weather overflows include:

- Twice-weekly inspections of the CSO regulators as required by the NPDES permit and outlined in the 1997 NMC Report.

- Remote CSO monitoring using level sensors and telemetry to communicate with a central SCADA system at the SRWTF to reduce impacts from CSOs by decreasing response times by maintenance staff.
- Completion of the Mill River Relief Project that increased in-system capacity upstream of the seven CSOs that discharge to the Mill River. Installation of five vortex valve throttling devices and one bending weir regulate flow, maximize in-system storage and protect against dry weather overflows.
- Completion of the Washburn Street CSO Project that replaced the existing regulator structure and facilitated the maintenance of dry weather flow to the sanitary pumping station has assisted in eliminating dry weather overflows at the regulator structure.
- Completion of the Indian Orchard Pump Station and Chicopee River CSO control project in May, 2009 which eliminated CSO Regulators 043 and 044, increased pumping capacity to the SWRTF by 18.5 mgd, and created 100,000 gallons of emergency storage at the pump station for extreme wet weather events or during a potential shut down of the pump station.
- Substantial completion of the Phase I Connecticut River CSO Control Project which included construction of sewer and drain improvements upstream of Regulator 007 and 049. These improvements will reduce CSO discharges at both regulators through targeted separation, increased conveyance for drain and sewer, and optimization of in system storage.
- Heavy grit removal and cleaning from the Connecticut River Interceptor in 2006.
- Heavy grit removal and cleaning from Connecticut River Interceptor near Orchard Street in 2009.
- Heavy grit removal and cleaning from targeted areas of Connecticut River Interceptor in 2010.
- Contracted inspection and cleaning of approximately 1,000,000 linear feet of combined sewers in from 2009 to 2013.

Based on data available from the remote monitoring system and inspection of the CSO overflows, during the past year there were no dry weather overflow events at CSOs.

6. Control of Solid and Floatable Materials in CSOs

The Commission has completed a system wide program for the installation of floatables control baffles. Additional cleaning that is mentioned in other sections also has eliminated solids from the collection system that may have been contributing to CSOs.

7. Pollution Prevention Programs to Reduce Contaminants in CSOs

a. City of Springfield and SWSC ordinances pertaining to pollution prevention programs remain as detailed in the April 1997 Nine Minimum Control Measures Final Report.

b. The City of Springfield conducts various programs which contribute to minimization of materials entering the CSOs including the following:
   -
     - Household Hazardous Waste Transfer Station for collection of household hazardous waste at scheduled events
     - Recycling
     - Erosion control measures
     - Street cleaning
     - Catch basin cleaning

8. Public Notification to Ensure the Public Receives Adequate Notifications of CSO Occurrences and Impacts

In accordance with the NPDES Permit, the Commission maintains identification signs at CSO locations identifying each location as "Springfield Water and Sewer Commission Wet Weather Sewage Discharge Outfall (No.)." Replacement signs were designed in 2012 and were installed as part of 2013 programs.

Pursuant to the Commission's NPDES permit, #MA0103331, the Commission annually reviews and places additional signage when beneficial for public notification. Resources are included in annual budget plans for these activities.

A. Website

The Commission's website at http://www.waterandsewer.org/ includes a section entitled "What are Combined Sewer Overflows (CSOs)?" This page defines CSOs, identifies CSO locations and corresponding impacted waterways, and describes activities that have been completed as well as proposed activities to reduce or eliminate CSOs. The website also provides updates to locations of projects and maintenance activities.

B. Citizen Council Meetings

The Commission attends various monthly citizen council meetings to ensure the public is informed of the status of CSOs in Springfield and on the Connecticut River and to provide updates on CSO related projects. In addition, the Commission holds specific project related community meetings as required to solicit input from customers and the public in active project areas.

C. Annual Report

The Commission publishes an Annual Report for each fiscal year. The Annual Report contains sections that detail sewer collection systems including CSOs. Maintenance and capital improvement projects on the CSO system are discussed, and the Commission's annual budget is detailed to include capital expenditures and maintenance activities.

D. Scholastic Outreach

The SRWTF conducts a scholastic outreach program by hosting classes at the facility to explain various aspects of water and wastewater collection and treatment including the importance of pollution prevention. The World Is Our Classroom is a teaching program dedicated to raise achievement levels of city 5th grade students to meet the science and technology goals of the Massachusetts Curriculum Framework and the Comprehensive Assessment System (MCAS) tests. A decision was made to create a "classroom within a company" at the Bondi's Island Wastewater Treatment Facility. This shapes a realistic environment, where it is possible to teach about the science of water and the technology of the wastewater treatment process. In turn, it inspires student interest and equips teachers to teach in an authentic environment. This goal sharpens the skills of analysis, creative thinking, identification of components and relationships, and interpretation of data. The program blends inquiry, problem solving, real-world learning experiences, project-based learning and group decision-making. Since this program began in 2003 approximately 15,500 students have participated.

9. Monitoring to Effectively Characterize CSO Impacts and the Efficacy of CSO Controls

A. Connecticut River Water Quality Sampling and Model

In 2001 and 2002 the Commission in conjunction with The City of Holyoke, the City of Chicopee, and the Pioneer Valley Planning Commission developed and performed a

Connecticut River Water Quality Sampling Program that gathered water quality sampling data at 12 select locations in receiving waters tributary to the Connecticut River or in the river itself. The program included both dry and wet weather sampling to determine fecal coliform and E. coli bacteria counts in the Connecticut River, Chicopee River, Mill River and Westfield River. The intent of this program was to generate data that would be used initially to model and analyze baseline conditions in the receiving waters. These baseline conditions would then be used to measure the efficacy of potential control strategies for the Commission's CSOs.

Water quality modeling was performed after the sampling program and subsequent discussions with DEP and EPA. Modeling included 3-month and 1 year base line condition simulations and subsequent evaluation of the impact of Phase I CSO Improvements. The analysis and report were completed in 2005. The Springfield Water and Sewer Commission initiated a program to update the model in 2011 as part of the development of the CSO Long term Control Plan. That work was completed in 2012 and results included in the LTCP. The Commission may advance the Water Quality Model further.

B. Permanent CSO Monitoring Program

This section details the review undertaken and summarizes the findings of the comparison of the 2013 Annual Rainfall and CSO Flow Meter Data Review against the 1976 typical year series currently being applied to the hydraulic model for CSO predictive analyses.

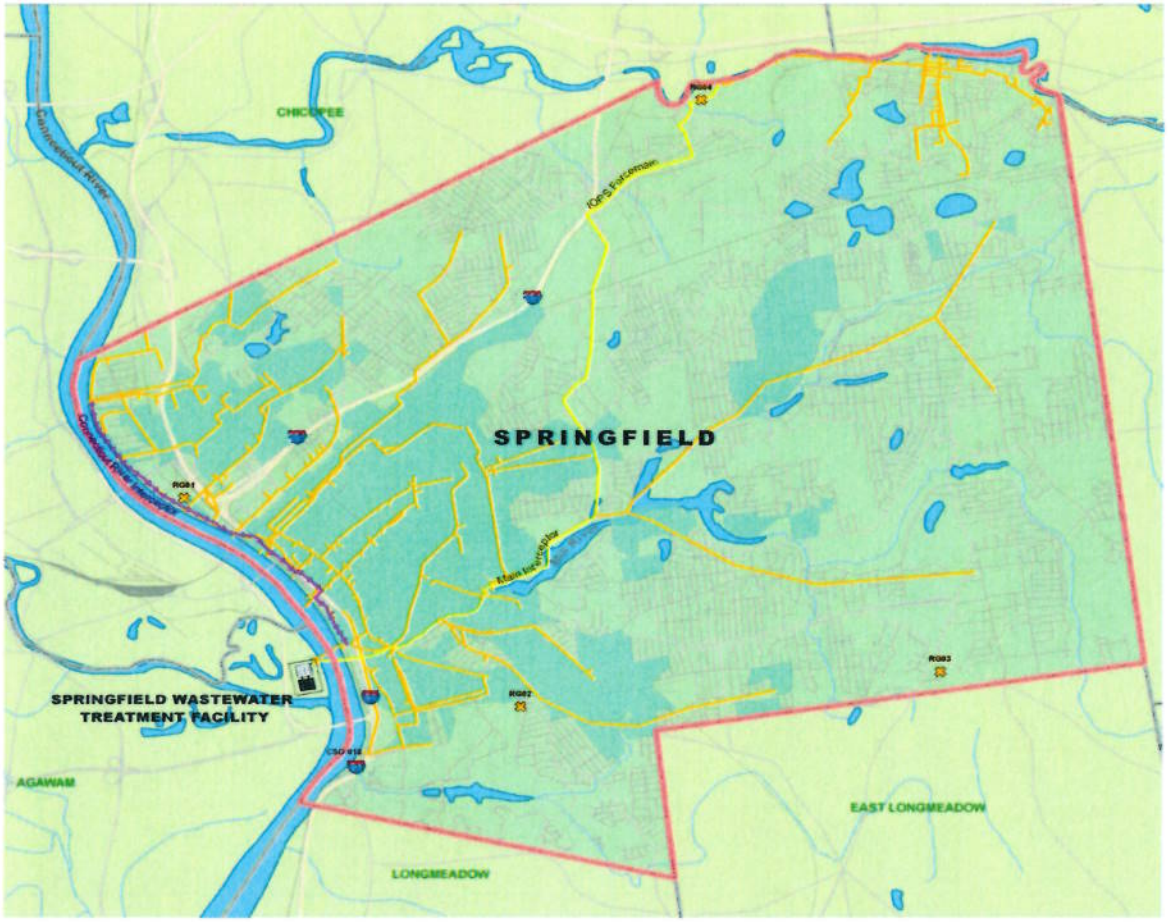
It incorporates the findings from an initial rainfall analysis of the four local rain gauges sited in the Springfield catchment and the recordings from the Bradley Airport Weather Station, during the entire calendar year 2013. The rainfall focused sections consider a breakdown of the annual rainfall recordings at all five gauges and how when applying some standard categorization they compare to the Springfield typical year, which is 1976.

Included are comparisons between the readings from the Springfield CSO overflow meters with the predicted result from when the sewer system hydraulic and hydrologic model is simulated using 2013 rainfall. Prior to undertaking these analyses the Springfield sewer model was updated to reflect recent changes in the network and the inclusion of 'as built' data.

Rainfall data was collected from the Bradley Airport Weather Station (maintained by USGS and located approximately 15 miles south of Springfield) and from the four local ADS-maintained rain gauges located within Springfield. The local rain gauges are positioned at the following locations in Springfield and as shown in Figure 9-1 below:

- RG01, stationed along the Connecticut River in the northwest portion of Springfield;
- RG02, stationed in the southwest portion of Springfield;
- RG03, stationed in the southeast portion of Springfield; and
- RG04, stationed in the northeast portion of Springfield.

Figure 9-1: Permanent Rain Gauge Locations in Springfield, MA



The first stage to reviewing the rainfall data recorded for 2013 was to compare the recorded rainfall depth at each of the four rain gauge sites. Spatial and temporal differences are an important consideration in understanding the potential impacts that wet weather has on CSO performance. The gauges are spread throughout Springfield and will therefore return varying total depth when compared across an entire year. Furthermore the recorded data for the Springfield gauges was benchmarked with the recorded rainfall data from the Bradley Airport Weather Station for consistent comparisons.

To better understand the nature of the rainfall that was recorded in Springfield during 2013, the annual hyetographs for the four local rain gauges and the data collected at the Bradley Airport gauge were disaggregated into both depth and intensity ranges. The ranges are designed to offer a breakdown as to the frequency of the individual rainfall events that comprise the annual hyetograph. The results of the breakdown of the annual rainfall total depth are contained in Table 9-1.

Table 9-1 2013 Rainfall Disaggregation by Total Depth

2013								
Data Set	Total Rainfall (inches)	Total No. of Storms	Number of Storms by Total Precipitation (inches)					
			0.01 to 0.13	0.14 to 0.25	0.26 to 0.50	0.51 to 1.0	1.01 to 2.0	> 2.0
Bradley Airport	51.54	125	55	16	26	11	14	3
ADS RG01	38.70	124	72	16	12	12	9	3
ADS RG02	45.59	121	55	18	17	15	14	2
ADS RG03	38.56	147	95	11	18	13	8	2
ADS RG04	31.29	137	87	18	13	12	4	3

What is immediately noticeable when considering the depth of rainfall within Springfield is that the spatial and temporal effects are giving variability in the total depth recorded. Upon further analysis of the data, the difference in the total depth of rainfall between RG01, the lowest, and RG02, the highest, is 6.89 inches; a variance of 18%. When using rainfall for model simulation purposes this type if variance can lead to extremely variable predicted results when used for CSO prediction.

Looking deeper into the breakdown of the annual series what is clear is that a large proportion of storms causing the mismatches fall into the lowest range, 0.01 to 0.13 inches. Generally this range of rainfall events do not cause CSOs to activate and therefore the most significant storms affecting Springfield should offer reasonable correlation. Where there is likely to be the greatest variance when comparing model predictions with recorded data is in the 0.14 to 0.25 inches range; these rainfall events generate storms that are either just under or over the CSO activation thresholds, and when considering that long periods of data can skew results. In this instance, the variability between RG03 (11 events), and RG02 (18 events) is a very significant variance and could introduce lower confidence to predictions.

One further observation from the table is that the Bradley Airport gauge records more rainfall than any of the Springfield gauges across all of the ranges. The total number of storms at Bradley Airport is equal to the median of the Springfield gauges and yet the total depth is 13% higher than RG02, the highest recoding in the city.

To obtain a more complete picture of the 2013 rainfall recording, the data was considered from a peak intensity perspective to better understand the rainfall characteristics, as this is an important factor in determining the extent to which CSOs activate. Details of rainfall distributions broken down by intensity are summarized in Table 9-2.

Table 9-2 2013 Rainfall Disaggregation by Intensity

2013							
Data Set	Total Rainfall (inches)	Total No. of Storms	Number of Storms by Peak Intensity (in/hr.)				
			0.01 to 0.10	0.10 to 0.25	0.25 to 0.50	0.50 to 1.0	> 1.0
Bradley Airport	51.54	125	70	30	14	9	2
ADS RG01	38.70	124	82	26	13	2	1
ADS RG02	45.59	121	69	35	11	5	1
ADS RG03	38.56	147	112	21	11	3	0
ADS RG04	31.29	137	102	24	5	5	1

Many of the details described for the total depth are applicable for the intensity and the ratios between the gauges are similar. What is noticeable from the returned data is the distribution at RG02; the highest total rainfall and yet the lowest number of storms in the 0.01 to 0.1 inches/hour range. This suggests that the application of this rainfall data to a model for CSO analysis purposes would offer a very different impact that applying say RG01 which returns 13 more 'low level' events and 9 fewer 'CSO trigger" events, when compared to RG02. The more severe rainfall data is better aligned across the rain gauges, which may offer correlation during more significant rainfall, but around the range when CSOs may or may not activate there are obvious differences.

This alternative look at the 2013 annual rainfall shows that once again the Bradley Airport data appears out of step with the Springfield gauges. In addition to the highest total depth recorded, the airport data generally records a greater number of events in the mid- to upper-level ranges in terms of both total depth and peak intensity. This consistent difference in the recordings means that the rainfall at the airport is not truly connected with Springfield and therefore rainfall recorded at Bradly airport could be used as a sanity check for the local gauges, but offers little indication as to what specific rainfall the Springfield sewer network is experiencing.

As described above, the Bradley Airport data appears to record more total rainfall than the Springfield gauges and that this total, when disaggregated into ranges, continues to give the highest number of storms in the ranges which cause CSOs activations. Tables 9-3a through 9-3d show the comparison of the local gauges with the Bradley Airport data between 2009 and 2012. Note the shaded cells represent gauges discounted from any analysis as they include recording errors.

Table 9-3a 2009 Rainfall Comparison by Total Depth

2009								
Data Set	Total Rainfall (inches)	Total No. of Storms	Number of Storms by Total Precipitation (inches)					
			0.01 to 0.13	0.14 to 0.25	0.26 to 0.50	0.51 to 1.0	1.01 to 2.0	> 2.0
Bradley Airport	47.56	134	52	28	22	20	11	1
ADS RG01	10.11	103	84	11	5	2	1	0
ADS RG02	23.91	101	62	15	6	11	7	0
ADS RG03	33.45	133	77	18	17	15	5	1
ADS RG04	27.97	139	87	21	12	15	3	1

Table 9-3b 2010 Rainfall Comparison by Total Depth

2010								
Data Set	Total Rainfall (inches)	Total No. of Storms	Number of Storms by Total Precipitation (inches)					
			0.01 to 0.13	0.14 to 0.25	0.26 to 0.50	0.51 to 1.0	1.01 to 2.0	> 2.0
Bradley Airport	42.51	102	45	12	15	17	11	2
ADS RG01	22.26	94	57	14	13	4	5	1
ADS RG02	37.28	106	49	16	20	8	12	1
ADS RG03	41.14	113	51	18	21	7	15	1
ADS RG04	6.38	58	43	5	9	1	0	0

Table 9-3c 2011 Rainfall Comparison by Total Depth

2011								
Data Set	Total Rainfall (inches)	Total No. of Storms	Number of Storms by Total Precipitation (inches)					
			0.01 to 0.13	0.14 to 0.25	0.26 to 0.50	0.51 to 1.0	1.01 to 2.0	> 2.0
Bradley Airport	68.12	131	39	19	19	36	13	5
ADS RG01	47.63	99	41	12	9	22	12	3
ADS RG02	50.28	143	75	12	15	26	13	2
ADS RG03	54.17	144	75	10	16	25	16	2
ADS RG04	31.65	102	55	13	11	15	6	2

Table 9-3d 2012 Rainfall Comparison by Total Depth

2012								
Data Set	Total Rainfall (inches)	Total No. of Storms	Number of Storms by Total Precipitation (inches)					
			0.01 to 0.13	0.14 to 0.25	0.26 to 0.50	0.51 to 1.0	1.01 to 2.0	> 2.0
Bradley Airport	38.14	132	70	18	17	19	8	0
ADS RG01	35.33	125	73	16	13	12	10	1
ADS RG02	33.40	127	75	14	12	19	7	0
ADS RG03	28.69	113	67	15	11	14	6	0
ADS RG04	27.75	138	89	18	11	14	6	0

Reviewing the four tables it is clear that although there are some variances, the trends reported for 2013 are consistent across all five years. One point to note is that the Bradley Airport gauge consistently records higher rainfall depths than any gauge in Springfield; however, in terms of storm distribution the airport gauge is no more variable than the four gauges located within the city.

Summarizing the findings from the 2009 to 2013 comparisons, it is evident that the use of four discrete gauges across a city the size of Springfield leads to significant variance in the recorded data, discounting the inevitable occasional gauge failure. If correlation is necessary, plus the ability to use the recorded data for modeling CSO performance, a more densely populated rain gauge network should be considered. The differences that are seen in the previous tables is sufficient evidence to support more gauges being used as the data clearly shows that the application of adjacent rainfall hyetographs will cause variable rates and volumes of runoff to be generated. This variability is such that the rainfall actually received in a particular CSO catchment may not be reflective of the nearest gauge recordings.

One of the key objectives of this annual analysis was to compare the 2013 rainfall with the 1976 typical year. Table 9-4 shows the total depth comparison and rainfall event range breakdown between the 2013 and 1976 series.

Table 9-4 1976 Rainfall Disaggregation by Total Depth

1976 v 2013								
Data Set	Total Rainfall (inches)	Total No. of Storms	Number of Storms by Total Precipitation (inches)					
			0.01 to 0.13	0.14 to 0.25	0.26 to 0.50	0.51 to 1.0	1.01 to 2.0	> 2.0
Typical year	42.2	128	58	20	23	18	7	2
ADS RG01	38.70	124	72	16	12	12	9	3
ADS RG02	45.59	121	55	18	17	15	14	2
ADS RG03	38.56	147	95	11	18	13	8	2
ADS RG04	31.29	137	87	18	13	12	4	3

When comparing the 2013 gauges with the 1976 series it is important to decide which of the gauges to compare; as each of the four gauges has returned a distinctly different total depth. RG01 is the closest to the median of the 2013 data and represents a comparable total depth of rainfall to 1976, albeit 9% lower. However, what is noticeable from this gauge data is that discounting the low level rainfall, there is a marked underrepresentation of the three depth ranges between 0.14 and 1.0 inches of rainfall and the more severe rainfall greater than 1.0 inch is over represented. When combined with the low level range which recorded 14 additional events in 2013; the overall total depth and total number of storms recorded do show correlation, however these are somewhat masking the change in distribution. CSO performance between 1976 and 2013 will be noticeably different as the rainfall patterns experienced are different.

The three other local rain gauges also fluctuate when compared to 1976 including RG02 offering double the number of events between 1.0 and 2.0 inches. Overall, 2013 looks to be a slightly drier year than the typical year, but the shift in event distribution towards the higher rainfall ranges and away from the low level events suggests this will not be reflected in CSO performance. For completeness the comparison between the 2013 and 1976 rainfall series have also been compared for peak intensity; the comparison is shown in Table 9-5.

Table 9-5 1976 Rainfall Disaggregation by Intensity

1976 v 2013							
Data Set	Total Rainfall (inches)	Total No. of Storms	Number of Storms by Peak Intensity (in/hr.)				
			0.01 to 0.10	0.10 to 0.25	0.25 to 0.50	0.50 to 1.0	> 1.0
Typical year	42.2	128	83	23	14	4	1
ADS RG01	38.7	124	82	26	13	2	1
ADS RG02	45.59	121	69	35	11	5	1
ADS RG03	38.56	147	112	21	11	3	0
ADS RG04	31.29	137	102	24	5	5	1

Unlike the depth comparison, the peak intensities for 2013 follow similar trends to the 1976 series. (With the exception of RG04 which is assumed to have malfunctioned during the year due to the outlying total depth measurement). Considering the combination of the depth and intensity comparisons these findings indicate that if the 2013 individual event depths are shifting towards the higher ranges and the intensities are remaining static by comparison while the overall annual depth is similar, the 2013 rainfall consists of longer duration and lower intensity events. It is likely that this means that there will be many more events that are on the cusp of CSO activations; CSOs by their intention in Springfield respond to shorter more intense rainfall and if the intensities are lower a larger accumulation of rainfall and the subsequent runoff is required for a wet weather response capable of activating a CSO regulator.

Continuing on from the previous sections where the rainfall recorded during 2013 was reviewed, this section of the report considers the effect of simulating the sewer network model with the 2013 rainfall and comparing the model performance against the CSO regulator meter recordings. The comparisons were made for both the number of annual activations and the total overflow volumes. All CSO regulators within Springfield were included in the analysis and for ease of understanding were classified in the Connecticut River, Mill River and Chicopee Systems.

The hydraulic sewer model used for the 2013 analyses was the 2012 model with the Washburn PS capped at 9mgd, per 2013 temporary metering findings.

The results summarized in Table 9-6 below show the initial comparisons between the rainfall hydrographs from the four ADS gauges applied to the model subcatchment based on geospatial referencing.

Table 9-6 Initial Comparative Results

CSOs	ADS Spill Report		Model Results	
	Total Spills	*Volume (MG)*	*Total Spills*	*Volume (MG)*
Connecticut River System				
CSO 007	1	0.08	0	0
CSO 008 *	8	20.88	12	9.7
CSO 010	37	74.46	47	151.0
CSO 011 **	4	0.07	18	7.32
CSO 012	47	194.45	30	55.7
CSO 013	26	12.85	21	39.8
CSO 014	38	16.02	39	42.8
CSO 015A	31	11.30	8	2.5
CSO 015B	9	0.38	14	1.8
CSO 016	35	85.78	36	63.6
CSO 018	13	0.77	3	0.1
CSO 049	15	1.87	2	0.1
Total	**264**	**418.90**	**230**	**374.50**
Mill River System				
CSO 017	22	1.78	2	0.23
CSO 019 **	7	8.26	2	0.31
CSO 024	7	1.26	2	0.03
CSO 025	18	2.23	19	1.19
CSO 045	24	0.70	0	0.00
CSO 046	23	2.43	8	0.22
CSO 048	12	0.53	2	0.55
Total	**113**	**17.2**	**35**	**2.5**
Chicopee System				
CSO 034	21	4.80	5	0.19
CSO 035 ***	11	1.80	2	0.08
CSO 036 ***	14	3.20	5	0.25
CSO 037	9	1.30	0	0.00

CSOs	ADS Spill Report		Model Results	
	Total Spills	*Volume (MG)*	*Total Spills*	*Volume (MG)*
Overflow 050	2	0.59	0	☼□00
Total	**57**	**11.7**	**12**	**0.52**

** Outfall meter was taken offline after May 27, 2013. Hence the CSO spills and volumes are only from Jan 1st through May 27th.*

*** Spill count and volume reported by ADS are using a weir equation. The meter is actually located on the upstream side of the weir.*

**** Stormwater connections are included in the meter reading and influence the results.*

The results of the initial comparison confirm that there are some correlations but generally the relationship between the observed (ADS recordings) and the predicted (Model results) is not immediately evident. The following steps were subsequently undertaken to better understand some of the reasons behind the differences and the extent of any mismatches.

The first step was to revisit what constitutes CSO activation, this was determined as:

- A rainfall event that had a peak flow greater than 0.005 MGD;
- A rainfall event that generated an overflow of at least 0.003 MG; and
- An antecedent dry period of a least 24 hours (previously this was 6 hours but was adjusted to align with the raw data reporting from the local meters).

The entire annual recorded spills data for all CSOs was compared with the corresponding total rainfall depth from the nearest rain gauge to determine levels of correlation. This step involved looking at the adjacent rain gauge data on days where the meters reported overflow activations, this found the following conditions:

- Overflows recorded with zero rainfall recorded at any of the Springfield gauges. Where this was the case these overflows were discounted;
- Overflows recorded where the total overflow volume was disproportionate to the recorded rainfall. To enable a consistent approach all overflow that corresponded to rainfall were characterized by the total rainfall depth based on the Rainfall Ranges detailed in this report. This allowed for a median overflow volume to be established for each range. The median overflow volume offered a volume that was not strictly correct but was consistent. The actual recorded overflows were subsequently compared with the overflow volumes corresponding to rainfall events associated with that range and where the recorded volume exceeded 125% of the median each volume was reviewed. The findings of applying this step found two issues. The first was that the rainfall recorded at RG01 and associated with Connecticut River System had a number of days where no rainfall was recorded during an overflow. However at the adjacent RG02, rainfall was recorded which was generally comparable to the observed spill volume. As a result the initial comparisons were revised without undertaking any further work other than re-simulating the sewer model and replacing the data from RG01 with RG02. Table 9-7 contains the results of the revision in the Connecticut River System.

Table 9-7 Revised Comparative Results

CSOs	ADS Spill Report		Model Results	
	Total Spills	*Volume (MG)*	*Total Spills*	*Volume (MG)*
Connecticut River System				
CSO 007	1	0.08	0	0
CSO 008 *	8	20.88	13	6.6
CSO 010	37	74.46	56	186.0
CSO 011 **	4	0.07	20	7.18
CSO 012	47	194.45	39	71.47
CSO 013	26	12.85	24	52.21
CSO 014	38	16.02	47	53.81
CSO 015A	31	11.30	8	3.82
CSO 015B	9	0.38	18	2.41
CSO 016	35	85.78	42	80.02
CSO 018	13	0.77	3	0.13
CSO 049	15	1.87	2	0.23
Total	**264**	**418.9**	**272**	**463.9**
Mill River System				
CSO 017	22	1.78	2	0.23
CSO 019 **	7	8.26	2	0.31
CSO 024	7	1.26	2	0.03
CSO 025	18	2.23	19	1.19
CSO 045	24	0.70	0	0.00
CSO 046	23	2.43	8	0.22
CSO 048	12	0.53	2	0.55
Total	**113**	**17.20**	**35**	**2.5**
Chicopee System				
CSO 034	21	4.80	5	0.19
CSO 035 ***	11	1.80	2	0.08
CSO 036 ***	14	3.2	5	0.25
CSO 037	9	1.30	0	0.00
Overflow 050	2	0.59	0	0.00
Total	**57**	**11.7**	**12**	**0.52**

** Outfall meter was taken offline after May 27, 2013. Hence the CSO spills and volumes are only from Jan 1st through May 27th.*

*** Spill count and volume reported by ADS are using a weir equation. The meter is actually located on the upstream side of the weir.*

**** Stormwater connections are included in the meter reading and influence the results.*

The second finding was that there were a number of overflow volume events that were orders of magnitude out of alignment; examples included an overflow of 1.2 MG following 0.03 inches of rainfall at CSO 012 and contrastingly 0.04 MG overflows following 2.69 inches in rainfall at CSO 014. Where these obvious errors were identified rather than discount the values, the median value was substituted. This allowed for the overflows to appear within the annual comparison but not so that unrealistic numbers could skew the comparisons. Table 9-8 includes the results of removing gross errors from the dataset.

Table 9-8 Revised Comparative Results

CSOs	ADS Spill Report		Model Results	
	Total Spills	*Volume (MG)*	*Total Spills*	*Volume (MG)*
Connecticut River System				
CSO 007	1	0.08	0	0
CSO 008 *	4	15.21	6	8.42
CSO 010	33	57.70	52	175.66
CSO 011 **	4	0.07	18	7.32
CSO 012	46	125.90	39	71.50
CSO 013	33	12.35	16	39.53
CSO 014	34	11.64	39	42.81
CSO 015A	21	7.39	8	3.52
CSO 015B	9	0.38	13	1.77
CSO 016	33	61.17	36	64.94
CSO 018	13	0.69	3	0.13
CSO 049	9	1.51	2	0.09
Total	**240**	**294.09**	**232**	**415.69**
Mill River System				
CSO 017	9	1.52	2	0.23
CSO 019 **	7	8.26	2	0.31
CSO 024	7	1.26	2	0.03
CSO 025	18	2.23	19	1.19
CSO 045	17	0.68	0	0.00
CSO 046	16	1.65	8	0.22
CSO 048	4	0.40	2	0.55
Total	**78**	**16**	**35**	**2.53**
Chicopee System				
CSO 034	11	3.11	5	0.19
CSO 035 ***	11	1.80	2	0.08
CSO 036 ***	14	3.20	5	0.25
CSO 037	5	1.31	0	0.00
Overflow 050	2	0.59	0	0.00
Total	**43**	**10.0**	**12**	**0.52**

** Outfall meter was taken offline after May 27, 2013. Hence the CSO spills and volumes are only from Jan 1st through May 27th.*

*** Spill count and volume reported by ADS are using a weir equation. The meter is actually located on the upstream side of the weir.*

**** Stormwater connections are included in the meter reading and influence the results.*

The results included in Table 9-8 do show some further correlation regarding regulator activations; however, the corresponding values for volume continue to show a wider tolerance. The final stage of the process to understand and align the recorded and observed data was to review the model overflow hydrographs against the meter observed hydrographs. This step is further discussed and demonstrated using some specific examples below.

In addition to reporting the performance at each of the regulators a final 'scrubbing' of both the meter and the model reporting data was performed. This procedure involved considering the impact of the Connecticut River levels on the CSO regulator outfalls. Where the river was sufficiently high to potentially cause inflows into the outfall pipes and where there was a corresponding recording that was either deemed unusual or disproportionate, the total ADS volume readings were halved. This approach was only completed on those CSOs known to be potentially influenced.

The final data analyses were completed on the model predictions. A final review of the 24 hour inter event period was performed to ensure a single event across two dates was not classified as two events. The model results on the Connecticut River system were also updated to incorporate the results from both RG01 and RG02; this meant that if rainfall was observed at RG02 and not at RG01 but the ADS meters reported overflow activations, the model results were updated to take account of rainfall in the general vicinity. This served to increase the number of activations and the total volume where considered applicable. The following summarizes the comparison between the observed data and the model predictions at each CSO regulator:

CSO Regulator 007

- No analysis was completed for this regulator.

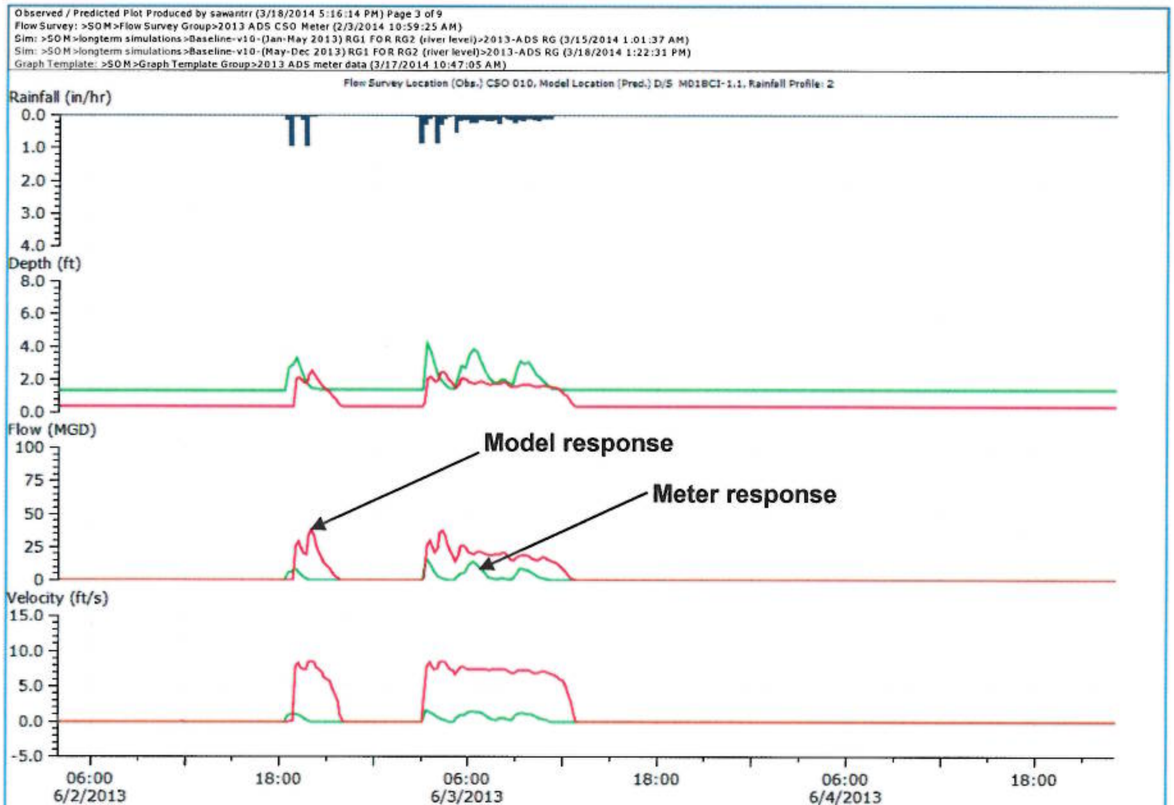
CSO Regulator 008

- Data was only reported between January and May as the meter was removed for construction;
- Good correlation between number of spills and annual volume although this was only a partial year; and
- The data adjustments included the removal of 7.6 MG of superfluous flow between May 22nd and 25th when no rainfall was recorded.

CSO Regulator 010

- Reasonable correlation between number of spills;
- Poor relationship for total volume with the model predicting almost 3 times the meter observations;
- Same relationship as represented in 2012 report;
- The spatial and temporal effects of the rainfall are very evident here. The possible difference in overflow volume between applying the rainfall from RG01 and RG02 is up to 45MG;
- The model is known to be sensitive to surcharging on the Connecticut River Interceptor (CRI) immediately downstream from this regulator, although temporary flow metering has shown that the mass balance inflows are well represented by the model; and
- Review of the volumes of rainfall versus the meter recording shows that the response to rainfall is disproportionate to the depth of rainfall recorded, an example is shown in Figure 9-2.

Figure 9-2 Revised Comparative Results at CSO 010



	Rainfall			Depth (ft)		Flow (MGD)			Velocity (ft/s)	
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min	Max	Min	Max	Volume (US Mgal)	Min	Max
Rain	2.100	0.920	0.031							
Obs.				1.296	4.195	0.000	16.580	1.974	0.000	1.550
...iver level)>2013-ADS RG				1.#IO	-1.#IO	1.#IO	-1.#IO	0.000	1.#IO	-1.#IO
...iver level)>2013-ADS RG				0.363	2.500	-0.000	38.692	9.741	0.000	8.584

The total depth of rainfall in the example is 2.1-in which would place this particular rainfall in the top 3 wet weather events recorded in 2013. Based on the meter data this overflow volume is 1.974 MG and would be the 13th largest overflow in the annual series when ranked on total volume. This type of disproportionate response is evident across the entire annual series and when coupled with the model sensitivities in the CRI leads to the 93MG difference in spill volume across the entire year.

CSO Regulator 011

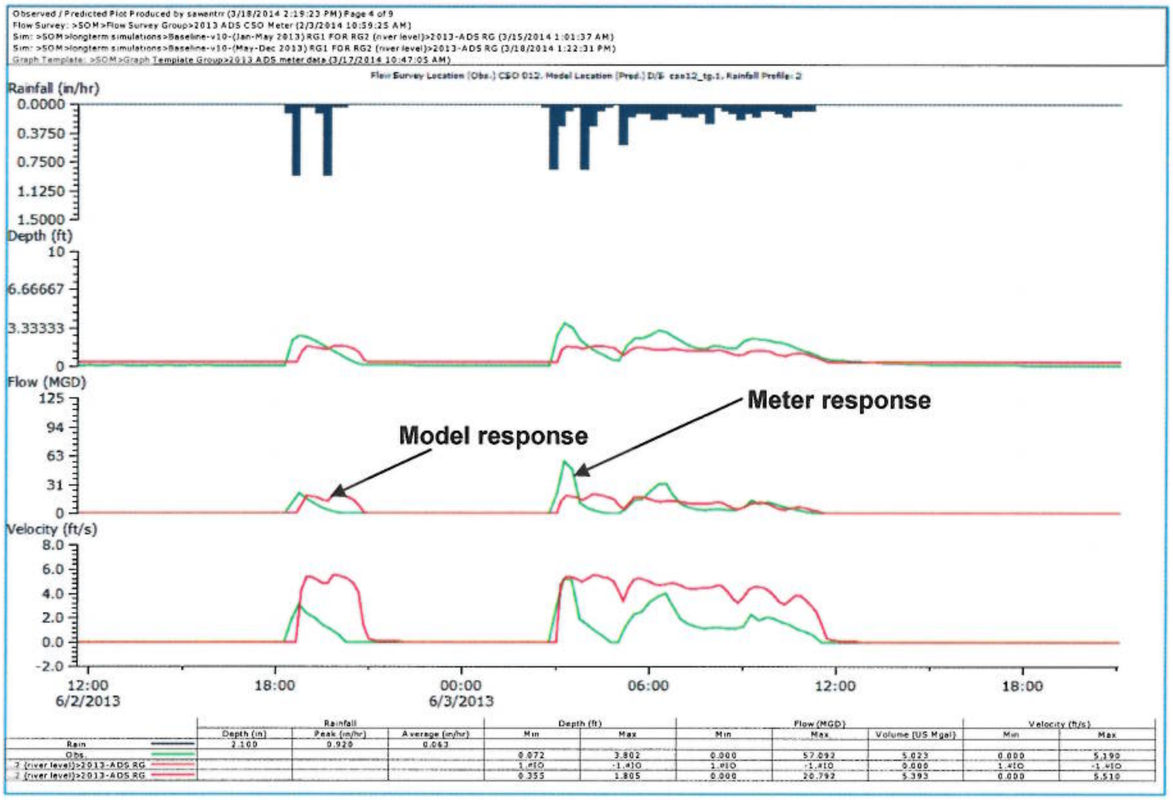
- Very low overflows returned from meter data;
- Two particular storms were noted during the analysis process, 9th August when 2.69-in of rainfall was observed and the 27th November when 2.73-in fell. Collectively these events generated overflows of 0.045MG. The two storms fall into the top 2.5 percentile and would normally be expected to generate more overflow volume, the model predicts 2.65MG for the same storms; and
- The application of the weir equation in this instance in lieu of an overflow meter creates difficulty in comparing model performance and observed data.

CSO Regulator 012

- Very good correlation between the number of overflows across the year;
- The model under predicts the CSO overflow volume;

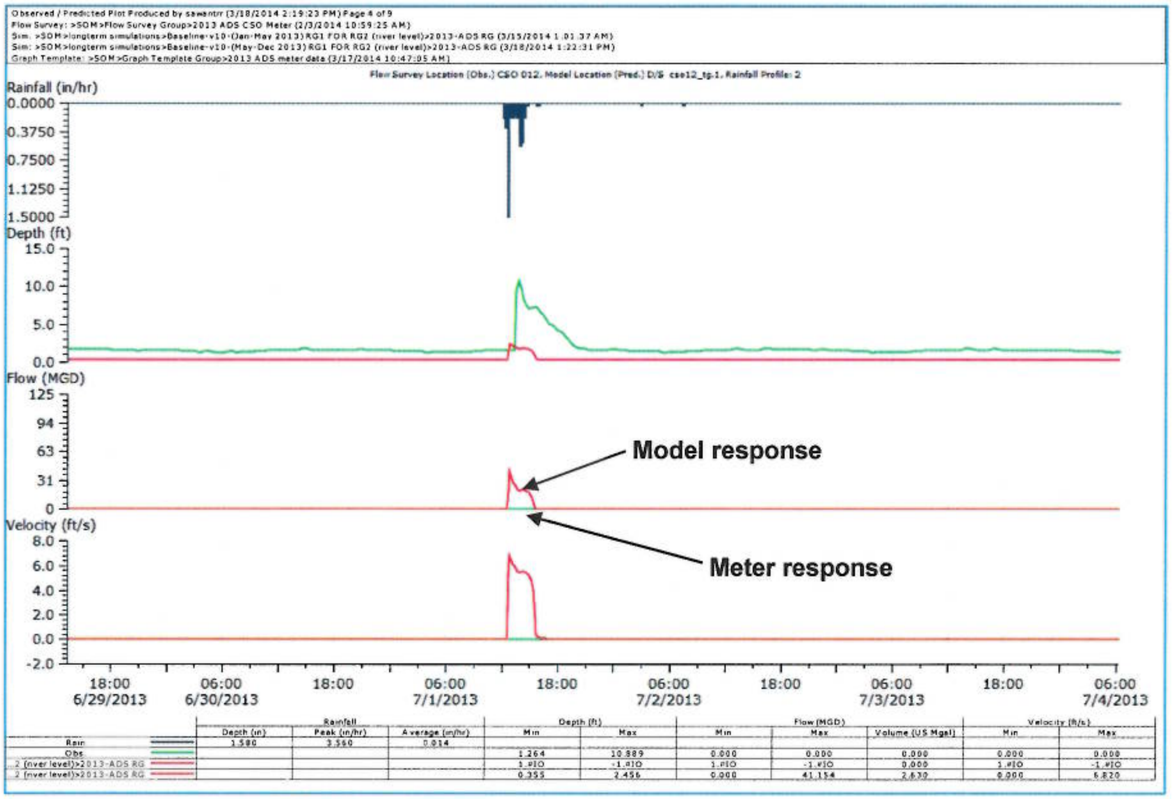
- The 2012 review found the same trends but the effects appear magnified in 2013;
- Hydraulically CSO 012 is related to CSO 010, although the relationship is not immediately obvious from the model results but may support further investigation of the CRI between the two regulators; and
- Occasional differences between the observed data and predicted results distort the overall comparison. Figure 9-3 shows a good comparison and Figure 9-4 a divergence.

Figure 9-3 Good Comparative Results Example at CSO 012



This graph shows a good volumetric balance across the rainfall event, 5.19 MG from the meter data and 5.51 MG predicted by the model. What is however evident is that the depth and velocity comparisons are variable. This is something which has not been particularly considered previously. The conditions associated with the meter locations and the modeling of overflow sewers does need to be improved; the localized hydraulics are influenced by operational issues (precise meter location in the pipe, presence of debris, etc) which are clearly having an effect on the analyses, although presently the impacts are difficult to fully determine.

Figure 9-4 Poor Comparative Results Example at CSO 012

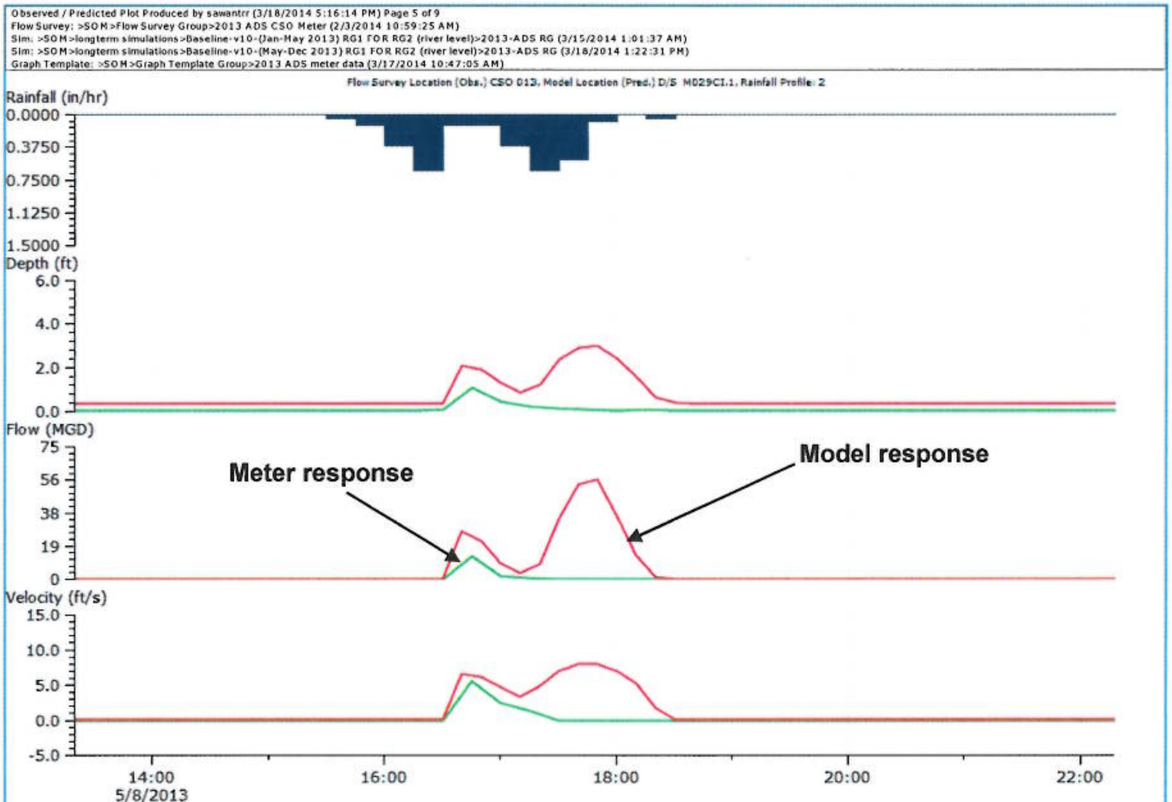


In this graph, no rainfall was measured by RG1. The graph below is for RG2 and it can be seen that the depth increases considerably but no flow or velocity is measured. The model response is due to using RG2 during this event but this event alone contributes a 2.6 MG mismatch to the overall total.

CSO Regulator 013

- Good relationship between the number of spills, the small difference is caused by a few small storm which report an overflow by the meters although they could be ignored as they are just above the threshold for spill reporting and contribute almost nothing volumetrically; and
- There were a number of poor responses to rainfall during the annual series at this regulator meter. Figure 9-5 below shows a typical example; it is therefore difficult to determine accuracy at this location. Further evidence with more frequent reviews of the data may be useful.

Figure 9-5 Example of a poor response to rainfall at CSO 013



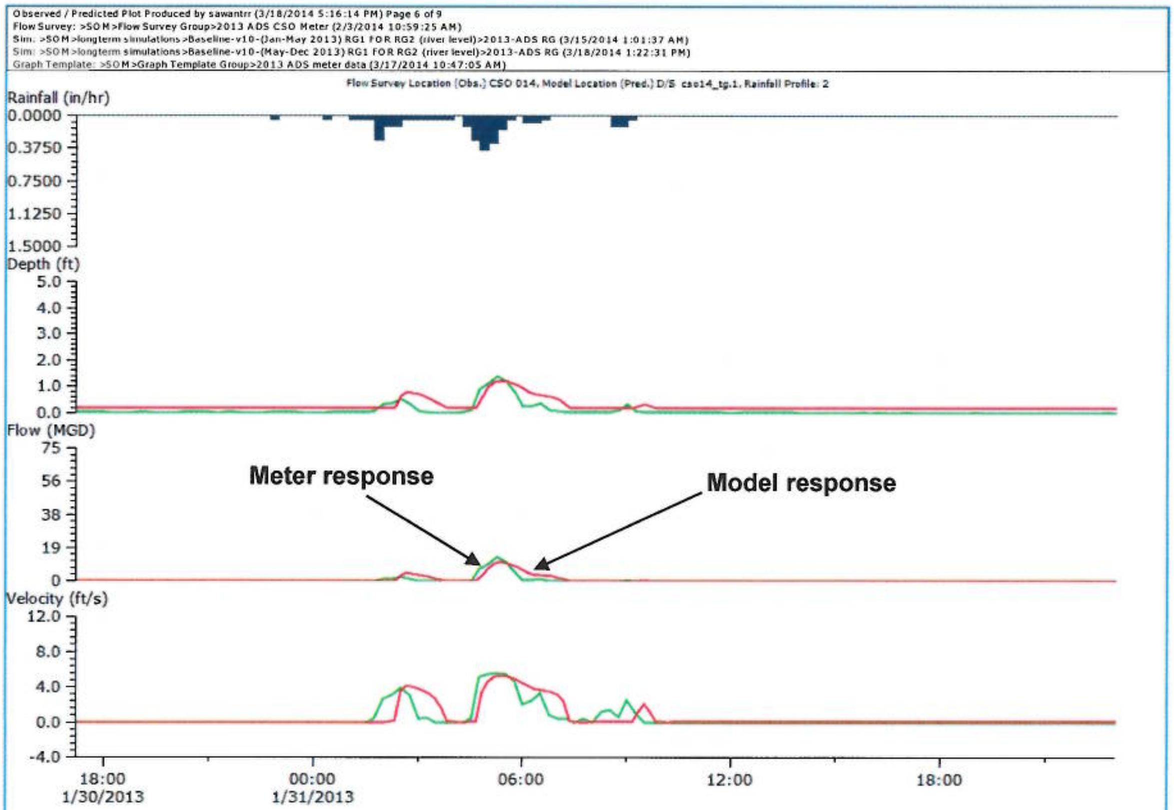
	Rainfall			Depth (ft)		Flow (MGD)			Velocity (ft/s)	
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min	Max	Min	Max	Volume (US Mgal)	Min	Max
Rain	0.760	0.640	0.084							
Obs.				0.032	1.075	0.000	13.018	0.156	0.000	5.630
...iver level)>2013-ADS RG				0.350	2.971	0.000	56.503	1.828	0.000	8.012
...iver level)>2013-ADS RG				1.#IO	-1.#IO	1.#IO	-1.#IO	0.000	1.#IO	-1.#IO

The meter does not respond to the second peak of the storm. The model is consistent in its response to the rainfall hyetograph. In this instance the event contains only 0.76-in of rainfall which is a 2013 25th percentile storm, and there is 1.7 MG difference in the overflow volume between the model and the meter.

CSO Regulator 014

- Good relationship between the total number of spills across the year;
- The performance of the meter at CSO 014 was variable, some good responses and some poor and resulted in less good volumetric comparisons Figure 9-6 shows a good response and Figure 9-7 depicts a poor relationship.

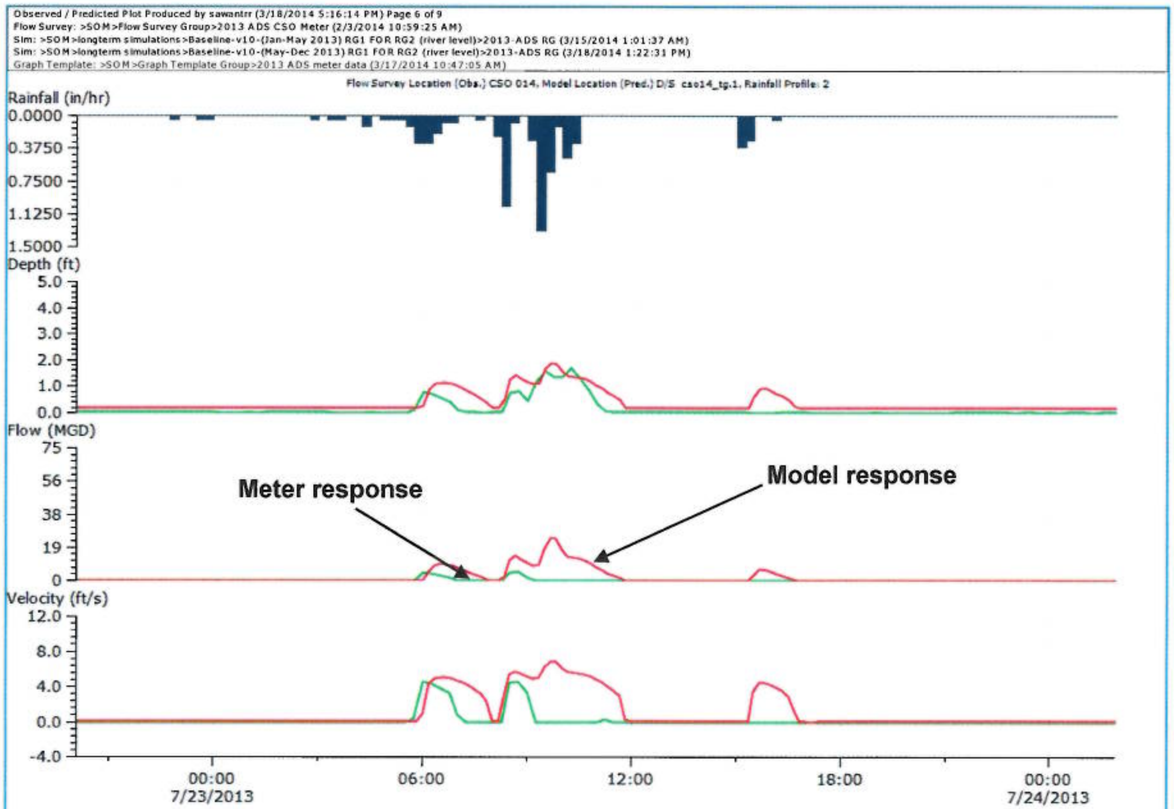
Figure 9-6 Example of a good response to rainfall at CSO 014



	Rainfall			Depth (ft)		Flow (MGD)			Velocity (ft/s)	
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min	Max	Min	Max	Volume (US Mgal)	Min	Max
Rain	0.690	0.400	0.023							
Obs.				0.000	1.376	0.000	13.256	0.565	0.000	5.630
...iver level)>2013-ADS RG				0.188	1.217	-0.000	10.547	0.725	0.000	5.255
...iver level)>2013-ADS RG				1.#IO	-1.#IO	1.#IO	-1.#IO	0.000	1.#IO	-1.#IO

In this example the depth of rainfall is 0.68-in and is deemed a mid-range storm when considering the annual rainfall recorded, the correlation between meter and model is good, the response to rainfall in both cases is good although the volumes are only approximately 0.7 MG. Note how the localized hydraulics are in evidence again despite the closeness of the comparison.

Figure 9-7 Example of a poor response to rainfall at CSO 014



	Rainfall			Depth (ft)		Flow (MGD)			Velocity (ft/s)	
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min	Max	Min	Max	Volume (US Mgal)	Min	Max
Rain	1.710	1.320	0.057							
Obs.				0.000	1.699	0.000	5.127	0.254	0.000	4.530
...iver level)>2013-ADS RG				1.#IO	-1.#IO	1.#IO	-1.#IO	0.000	1.#IO	-1.#IO
...iver level)>2013-ADS RG				0.188	1.876	0.000	24.431	2.261	0.000	6.841

In this example the model shows a larger response to the rainfall recorded and this could most certainly be in part the result of the application of the hyetograph from RG02 rather than RG01. What is of importance here is that this event has a depth of 1.71-in, almost three times that of the example in Figure 5; the result of this comparison is that the model predicts an overflow of 2.3 MG compared with a recorded volume of 0.25 MG at the meter. These discrepancies when aggregated explain the volumetric difference despite the closeness of the overflow activation number.

CSO Regulator 015A

- Good comparison between CSO activations
- Relatively small overflow compared to others in the Connecticut River System; and
- Good total overflow volume comparison.

CSO Regulator 015B

- Good comparison between CSO activations
- Very small overflow compared to others in the Connecticut River System; and
- Even the larger wet weather events at this CSO cause relatively small overflow volumes (<0.1 MG). Many are around the cusp of triggering the CSO and so the small variation in annual volume is negligible when reviewed on an individual basis.

CSO Regulator 016

- Excellent correlation between the predicted results and the observed data. Although there were some large overflows recorded (>1 MG) that were removed as no corresponding rainfall was predicted at any of the rain gauges. It is assumed that these relate to river ingress although not confirmed; and
- This CSO is a larger contributor to the annual series and when analysing the performance, the most important factor was the choice of rainfall hyetograph; RG01 or RG02, the most appropriate in the end was a combination of the two which further demonstrates the importance of reducing the effects of spatial and temporal rainfall by having sufficient gauges in each CSO catchment to relate the overflows to the actual rainfall experienced upstream.

CSO Regulator 018

- Good comparison between CSO activations;
- Very small overflow compared to others in the Connecticut River System; and
- Even the larger wet weather events at this CSO cause relatively small overflow volumes (<0.1 MG). Many are around the cusp of triggering the CSO and so the small variation in annual volume is negligible when reviewed on an individual basis.

CSO Regulator 049

- Good comparison between CSO activations;
- Very small overflow compared to others in the Connecticut River System; and
- The differences between the observed and predicted data at this CSO generally relate to small volume events below the 1-in total depth threshold. The model CSO doesn't activate much below this threshold and there are a few events based on the meter data that do. If these minor spills are further removed the meter spills fall to 4 with an annual overflow volume of 1.04 MG. However, there is no justification for their removal and therefore they have been retained, as shown in Table 9-9.

Table 9-9 Final Comparative Results - Connecticut River System

CSOs	ADS Spill Report		Model Results	
	Total Spills	*Volume (MG)*	*Total Spills*	*Volume (MG)*
Connecticut River System				
CSO 007	1	0.08	0	0
CSO 008 *	5	10.85	6	8.42
CSO 010	33	57.70	45	150.54
CSO 011 **	4	0.07	18	7.37
CSO 012	46	125.90	43	86.07
CSO 013	21	7.45	16	39.53
CSO 014	34	13.15	39	42.81
CSO 015A	21	7.39	13	5.88
CSO 015B	9	0.38	12	1.77
CSO 016	33	61.17	34	64.94

CSOs	ADS Spill Report		Model Results	
	Total Spills	*Volume (MG)*	*Total Spills*	*Volume (MG)*
CSO 018	13	0.69	3	0.13
CSO 049	9	1.51	4	0.32
Total	**229**	**286.34**	**233**	**407.78**

** Outfall meter was taken offline after May 27, 2013. Hence the CSO spills and volumes are only from Jan 1st through May 27th.*

*** Spill count and volume reported by ADS are using a weir equation. The meter is actually located on the upstream side of the weir.*

Overall the Connecticut River System is variably matched, a number of inconsistencies with the most prominent CSO regulator meters have caused some differences in the volume. The single biggest factor influencing the comparisons is the spatial and temporal variability of the rainfall, these are initially identified in Tables 9-1 and 9-2 but the effects are seen when considering the difference between Tables 9-6 and 9-7, where difference between applying the rainfall recorded at RG01 and RG02 is 82 MG in annual predicted overflows across CSOs 010, 012, 013 and 016.

CSO Regulator 017

- Very limited data to form an opinion about a relationship between the meter and model predictions;
- All reported activations are included as there is insufficient data to form any trends for rainfall depth to overflow volume; and
- The size of the overflows at this regulator is close to the model's lower threshold for identifying spills and hence the difference in overflow activations.

CSO Regulator 019

- Very limited data to form an opinion about a relationship between the meter and model predictions;
- All reported activations are included as there is insufficient data to form any trends for rainfall depth to overflow volume;
- The size of the overflows at this regulator is close to the model's lower threshold for identifying spills and hence the difference in overflow activations; and
- The application of the weir equation in this instance in lieu of an overflow meter creates difficulty in comparing model performance and observed data.

CSO Regulator 024

- Very limited data to form an opinion about a relationship between the meter and model predictions;
- All reported activations are included as there is insufficient data to form any trends for rainfall depth to overflow volume; and
- The size of the overflows at this regulator is close to the model's lower threshold for identifying spills and hence the difference in overflow activations.

CSO Regulator 025

- Very good correlation for both volume and activation count.

CSO Regulator 045

- All reported activations are included as there is insufficient data to form any trends for rainfall depth to overflow volume; and
- The size of the overflows at this regulator are generally close to the model's lower threshold for identifying spills and hence the difference in overflow activations.

CSO Regulator 046

- The annual series contained a number of storms that required aggregating together and determining the actual number of activations formed the majority of the annual overflow;
- The size of the overflows at this regulator is close to the model's lower threshold for identifying spills and hence the difference in overflow activations; and
- Insufficient overflows to determine any trends relating to magnitude so all reported overflows are included.

CSO Regulator 048

- Good comparisons for both total number of activations and overflow volume;
- The size of the overflows at this regulator is close to the model's lower threshold for identifying spills and hence the difference in overflow activations; and
- The model and the meter data followed similar trends throughout the annual series although a relatively small regulator.

Table 9-10 Final Comparative Results - Mill River System

CSOs	ADS Spill Report		Model Results	
	Total Spills	*Volume (MG)*	*Total Spills*	*Volume (MG)*
Mill River System				
CSO 017	9	1.52	2	0.23
CSO 019 **	7	8.26	2	0.31
CSO 024	7	1.26	2	0.03
CSO 025	18	2.23	19	1.19
CSO 045	17	0.68	0	0.00
CSO 046	16	1.65	8	0.22
CSO 048	4	0.40	2	0.55
Total	**78**	**16.00**	**35**	**2.53**

*** Spill count and volume reported by ADS are using a weir equation. The meter is actually located on the upstream side of the weir.*

The overriding trend across the CSOs in the Mill River system was that many of the storms that caused meter activations were at or just below the threshold of the model to report activations. The exception was CSO 025 which showed a good relationship.

In summary there were insufficient overflows at the individual CSO to really determine any trends relating to magnitude so all reported overflows are included in the table above. When aggregated across the entire year these show a mismatch but the total volumes are relatively small and since many of the corresponding model results show that the CSOs were breached, although the resultant volumes were below the threshold and reported as zero, the variance is magnified.

CSO Regulator 034

- There is some correlation between the model predictions and the meter recordings; and

- Differences appear to lie in some small storms that appear to have a disproportionate response. However, there are too few overflows to anticipate any real trends and warrant exclusion.

CSO Regulator 035

- This meter is sited in a location influenced by storm drain connections on the downstream side of the CSO weir. The extent of the influence from the stormwater is difficult to quantify and / or replicate within the model and therefore the results presented in this report have not been further analysed as part of this process.

CSO Regulator 036

- This meter is sited in a location influenced by storm drain connections on the downstream side of the CSO weir. The extent of the influence from the stormwater is difficult to quantify and / or replicate within the model and therefore the results presented in this report have not been further analysed as part of this process.

CSO Regulator 037

- Limited data to form an opinion about a relationship between the meter and model predictions; and

- The model predicted no spills during 2013 and previously this meter recorded no spills for storms of similar magnitude.

Overflow 050

- Of the two spills recorded, one was due to a temporary pump failure and therefore an operational cause and discounted from the measurement data set. The resulting data is too limited to form an opinion about a relationship between the meter and model predictions.

Table 9-11 Final Comparative Results - Chicopee System

CSOs	ADS Spill Report		Model Results	
	Total Spills	*Volume (MG)*	*Total Spills*	*Volume (MG)*
Chicopee System				
CSO 034	11	3.11	5	0.19
CSO 035 ***	11	1.80	2	0.08
CSO 036 ***	14	3.20	5	0.25
CSO 037	5	1.31	0	0.00

CSOs	ADS Spill Report		Model Results	
	Total Spills	*Volume (MG)*	*Total Spills*	*Volume (MG)*
Overflow 050	1	0.15	0	0.00
Total	**42**	**9.6**	**12**	**0.52**

**** Stormwater connections are included in the meter reading and influence the results.*

Of the five CSOs in the Chicopee system, only two were considered as part of this analysis, No analysis was completed for CSOs 035 and 036 as the unquantifiable nature of the stormwater connections would have prevented any correlation. The meter data at CSO 034 appeared prone to excessive volume when compared with the model although there was some correlation during the larger storm events; the smaller ones are generally at or below the model threshold for identifying activations. CSO 037 is not predicted to activate during 2013 and this is consistent with previous years and the typical year, so no overflows were expected. However, there are too few overflows to anticipate any real trends and warrant exclusion from this dataset and the same issues as described above regarding model overflow thresholds is also applicable here.

In conclusion, the review of the 2013 annual rainfall total collected in Springfield found that the spatial and temporal effects resulted in variability of depth recording across the four rain gauges. Upon further analysis of the data, the difference in the total depth of rainfall between RG01, the lowest, and RG02, the highest, was 6.89-inches; a variance of 18%. When using rainfall for model simulation purposes this type of variance can lead to variable predicted results when used for CSO understanding.

Further analysis showed that the Bradley Airport records recorded more rainfall than the Springfield gauges and despite the total number of storms being equal to the median of the Springfield gauges; the total depth was 13% higher than RG02, the highest recording in the city for 2013. To ascertain whether this was a one off or a recurring trend, rainfall comparison from 2009 to 2012 were added to the 2013 analyses.

The findings of this extended review were that although there were some variances, the trends reported for 2013 were consistent across the last five years. Furthermore, the spatial and temporal differences between Bradley Airport and Springfield in terms of storm distribution are no more variable than the differences between the four local gauges in the city. However the total depth reported at Bradley Airport is consistently higher than the highest recording gauge across the entire five year period; suggesting that the airport gauge should not be used in lieu of the city gauges but as a guide only.

The 2013 rainfall data was subsequently compared with the 1976 Typical Year series and noted that the annual depth for the two years was similar but that the 2013 rainfall consists of longer duration and lower intensity events. The conclusion being that these differences will likely result in more events occurring on the cusp of CSO activations; CSOs in Springfield generally respond to shorter more intense rainfall and if the intensities are lower, a larger accumulation of rainfall (and runoff) will be required for a wet weather response capable of activating a CSO regulator.

The second part of the 2013 review involved applying the rainfall records from the city gauges to the Springfield Hydraulic sewer model and comparing the model results with the CSO regulator meter data. The Connecticut River System was overall variably matched, with the majority of the differences in volume between meter and model attributable to the larger CSO regulators. The single biggest factor influencing the comparisons was the spatial and temporal variability of the rainfall; the analysis completed showed that the difference between applying the rainfall recorded at RG01 and RG02 would result in an annual overflow difference of 82 MG across CSOs 010, 012, 013 and 016; the largest regulators in the system when considered by total annual overflow volume.

The results from the Mill River system were hindered by an overriding trend where many of the storms with meter activations were at or just below the threshold of the model's ability to report overflows. The exception was CSO 025 which showed a good adherence. There were insufficient overflows in this system to form any trends relating to rainfall depth and overflow magnitude so all reported overflows were included in the analyses. When aggregated across the entire year these appear to show significant difference in total volumes but this is a slightly unrealistic situation since many of the overflows were relatively small in volume and since many of the corresponding model results were reported as zero, the variance was exaggerated.

The results from the Chicopee system consisted of CSOs 034, 037 and Overflow 050, were similarly hindered to many CSOs in the Mill River system, low flows close to the model overflow reporting threshold. No analysis was completed for CSOs 035 and 036 as the unquantifiable nature of the stormwater connections at these locations meant no conclusions could be drawn.

Recommendations based on the findings of this report for possible use in future analyses include:

- The review of the last 5 years rainfall depth data collected at the Bradley Airport gauge is consistently higher than those gauges located within Springfield. This data is acceptable for comparative purposes but is not suitable for use with the Springfield model;

- The overriding issues with the rainfall data throughout 2013 were the spatial and temporal effects, which can give vastly differing results when applied to the hydraulic model. The current density of gauges is insufficient as was noted that a change in gauge could affect the overflows from the Connecticut River system by as much as 80 MG and more rain gauges would assist the analysis;

- The variability of the meter data and the variable responses to both rainfall and when there is no rainfall requires further investigation. Specifically relating to the actual positioning of the meter and what constitutes 'normal' measurements even if dry to help understand what is reasonable and what can be discounted;

- At those CSOs, particularly in the Mill River and Chicopee Systems, the model sensitivity for overflow thresholds requires review and to adopt a more CSO specific set of parameters. However these changes will need to be undertaken in conjunction with an increased meter confidence to establish the levels at which to set thresholds;

- The model is conservative in terms of runoff prediction and the CRI, the interceptor between CSO regulators 010 and 012 is particularly sensitive to rainfall responses. The physical data in the model is good and the operation of the system is assumed to be of neutral impact; operational practices and requirements may explain some of the differences so perhaps further details on those ongoing practices could be tied into future analyses;

- The differences between observed and predicted overflow volumes when considered across the entire year show a large volumetric divergence; CSO 010 is a prime example, to reduce the impact of this a recommendation is that future annual investigations incorporate monthly data reviews. An incremental approach will allow for increased understanding and corrective actions to be applied should any divergence be uncovered;

- The application of the weir equation in lieu of actual meter data appears to significantly mismatch with the model and means a comparison with the model overflow predictions are difficult. More clarity as to the application and / or an alternative methodology may be required; and

- The hydraulics associated with the meter locations and the modeling of overflow sewers need to be improved; the localized hydraulics is clearly having an effect on the analyses, although presently the impacts are difficult to fully determine.

UNITED WATER ENVIRONMENTAL SERVICES, INC.
190 M STREET EXTENSION
AGAWAM, MA 01001
TEL 413-732-6501
FAX 413-732-7071
WWW.UNITEDWATER.COM

March 14, 2014

Kathy Pedersen
Executive Director,
Springfield Water & Sewer Commission
Post Office Box 995
Springfield, MA 01101-0995

RE: NPDES MA0103331 CSO Certification Letter for 2013

Dear Ms. Pedersen;

In accordance with requirement of NPDES MA 0103331, Section 2,a, by this letter United Water Environmental Services Inc. hereby certifies that the calendar year 2013 weekly CSO inspections have been conducted, results recorded and records maintained.

Sincerely

Ralph Jagelavicius
Project Manager
United Water Environmental Services Inc.

cc: f/Springfield/SWSC/Correspondence

2013 CSO Discharge Summary

Springfield, MA

	Discharge Summary By Site				Monitoring Method
	Site	Watershed	# of Events	Total Volume	
1	CSO 017	Mill River	22	1,779,678	downstream ultrasonic level
2	CSO 019	Mill River	7	8,258,252	upstream ultrasonic level
3	CSO 024	Mill River	7	1,258,549	downstream ultrasonic level
4	CSO 025	Mill River	18	2,231,926	downstream ultrasonic level
5	CSO 045	Mill River	24	696,907	downstream ultrasonic level
6	CSO 046	Mill River	23	2,425,282	downstream ultrasonic level
7	CSO 048	Mill River	12	529,896	downstream ultrasonic level
		Mill River Total =	**113**	**17,180,490**	
20	CSO 034	Chicopee River	21	4,848,079	downstream ultrasonic level
21	CSO 035	Chicopee River	11	1,754,309	downstream ultrasonic level
22	CSO 037A	Chicopee River	9	1,342,675	downstream ultrasonic level
23	CSO 036A	Chicopee River	14	3,160,177	downstream ultrasonic level
		Chicopee River Total =	**55**	**11,105,240**	
8	CSO 007	Connecticut River	1	83,745	downstream ultrasonic level
9	CSO 008	Connecticut River	7	20,903,159	downstream ultrasonic level
10	CSO 010	Connecticut River	37	74,458,029	downstream ultrasonic level
11	CSO 011	Connecticut River	4	68,587	upstream ultrasonic level
12	CSO 012	Connecticut River	47	194,448,810	downstream ultrasonic level
13	CSO 013	Connecticut River	26	12,852,148	downstream ultrasonic level
14	CSO 014	Connecticut River	38	16,018,578	downstream ultrasonic level
15	CSO 015A	Connecticut River	31	11,302,300	downstream ultrasonic level
16	CSO 015B	Connecticut River	9	379,084	downstream ultrasonic level
17	CSO 016	Connecticut River	35	85,782,134	downstream ultrasonic level
18	CSO 018	Connecticut River	16	768,415	downstream ultrasonic level
19	CSO 049	Connecticut River	15	1,873,060	downstream ultrasonic level
		Connecticut River Total =	**266**	**418,938,047**	
		System Total =	**434**	**447,223,778**	
	042 Inf Bypass	Connecticut River	11	4,307,000	weir ultrasonic level
	WWTP Sec Bypass	Connecticut River	30	91,875,000	calculation

Discharge Summary By Month		
Month	**Avg Rain**	**Total Volume**
January	1.88	14,414,119
February	1.74	11,753,099
March	1.90	13,706,846
April	1.88	8,163,220
May	5.17	74,496,439
June	8.29	99,301,183
July	3.56	54,438,530
August	3.91	46,162,199
September	1.41	38,377,715
October	1.65	21,038,999
November	3.34	40,817,564
December	1.65	24,553,864
Total	**36.39**	**447,223,778**

Rainfall Summary	
Site	Total Rain
RG01	36.42
RG02	46.20
RG03	38.56
RG04	31.29
Average	38.12
WWTP Rain	44.30

Number of Overflows	
030 Liberty	0
031 Canton	0
032 Carew	0
040 Tiffany	1
050 IOPS	2

SPRINGFIELD WATER
AND SEWER COMMISSION

Post Office Box 995
Springfield, Massachusetts
01101-0995

413 787-6256
FAX 413 787-6269

March 31, 2014

U.S. Environmental Protection Agency
Discharge Monitoring Reports (OES4-SMR)
5 Post Office Square-Suite 100
Boston, Massachusetts 02109-3912

Re: NPDES Permit MA0101613 Requirements - Inflow and Infiltration (I/I)

To Whom It May Concern:

The Springfield Water and Sewer Commission (Commission) maintains and operates over 500 miles of sewers within its jurisdiction. Ongoing maintenance programs include video inspection, jetting, rodding, vacuuming, and other methods of cleaning and inspecting sanitary and combined sewers and manholes. As Inflow/Infiltration problems are found during the course of operations and maintenance activities the appropriate actions are taken.

United Water L.L.C. in their role as the contract operator of the treatment facility, the Combined Sewer Overflows, and Flood Control Systems has conducted the annual inspections of the flood control/inflow structures on the combined sewer system as required by NPDES Permit MA0103331. United Water L.L.C. also routinely monitors flow data recorded at the Springfield Regional Wastewater Treatment Plant and contributing communities and any irregular and or increased flows are investigated.

The Commission has continued to advance its sewer assessment program as part of the CMOM component of our USEPA Administrative Consent Order (Docket No. 08-037) and as part of our CSO program. To that effect, the Commission has continued its comprehensive condition assessment of the collection system which includes cleaning, inspection, I/I evaluation, risk and consequence of failure evaluations, and flow metering programs. Findings are being appropriately addressed as short term and long term repair/replacement projects.

We continue to advance these programs to satisfy our NPDES, CMOM, and CSO requirements. Additional detailed information can be found in the 2013 CMOM and CSO reports required by NPDES Permit MA0103331.

If there are any questions regarding this or any other matter please contact this office at your earliest convenience.

Respectfully,

Springfield Water and Sewer Commission

By: Joshua D. Schimmel
Operations Director - Wastewater

Cc: Katherine J. Pedersen, Springfield Water and Sewer Commission
MADEP-Western Regional Office

Town of
LONGMEADOW, MASSACHUSETTS
31 Pondside Road – 01106
TEL (413) 567-3400 ~ FAX (413) 567-9018
E-mail: publicworks@longmeadow.org

Incorporated 1783

DEPARTMENT OF PUBLIC WORKS

February 14, 2014

Mr. Joshua Schimmel
Springfield Water & Sewer Commission
P.O. Box 995
Springfield, MA. 01101-0995

Dear Mr. Schimmel,

I am responding to your letter I received on January 29, 2014, concerning the new National Pollutant Discharge Elimination System Permit for the Springfield Regional Wastewater Treatment Facility. The following is a brief summary of the Town's efforts to reduce or eliminate excessive infiltration/inflow in 2013.

During 2013, the Town continued its contract with National Water Main to perform sewer pipeline television inspections. They have videotaped over 71,000 ft. of our sewer system and will finish in 2014. The television inspection will be used to determine joint conditions, root intrusions, sources of infiltration and help locate any structural deficiencies in the system. The videos and log forms will be looked at to determine where the problem areas are located so repairs and recommendations can be made for main replacements in the future. Three manholes were found by the video inspection work that has fair amounts of I/I. These manholes will be repaired in 2014.

As part of the Town's FY14 sewer capital infrastructure projects, we replaced 1,300 ft. of sewer main on Ellington Street along with 5 manholes. This project is one of the several projects that were identified from the video inspection project because the VC sewer was cracked and broken in multiple locations allowing I/I into the collection system. Another FY14 project will include replacement of 2,150 ft. of sewer main on Laurel Street which will begin in the spring. The Town also replaced 800 ft. of sewer main that was also identified as poor during a drainage replacement project on Merriweather Drive.

The Town still continues its program of sewer line maintenance which is carried out on a daily basis throughout the year. During this effort, attention is given to the condition of the manholes, excessive flows and any other abnormalities in the manholes. If excessive flows are found, crews are dispatched to find and correct the problem.

FY15 sewer capital projects will include replacements on Colton Place and Knollwood Circle. These projects will be put on the warrant for the Town spring meeting. These projects will also help in I/I reduction.

If further information is required, please call.

Sincerely,

Peter W. Thurber

Peter W. Thurber
Assistant DPW Director
Water and Wastewater
Operations

TOWN OF AGAWAM
Department of Public Works
1000 Suffield Street • Agawam MA 01001
Tel (413) 821-0600 • Fax (413) 821-0631
Christopher J. Golba – Superintendent

February 3, 2014

Mr. Joshua Schimmel,
Director of Wastewater Operations
Springfield Water and Sewer Commission
P.O. Box 995
Springfield, MA 01101-0995

Dear Mr. Schimmel:

The City of Agawam completed the separation of its sewer and drain systems in 2000. This accomplishment greatly reduced inflow into our sewer system and eliminated our combined sewer overflows.

The Department of Public Works continues to fund the plumbing inspector in the Water Departments budget which gives us some influence in his work. He is on the watch for cellar sump pump connections to the building sewer and in the past year noticed several such installations, which we were able to have removed. Also, all new houses are required to have foundation drains installed. These drains are not allowed to be connected to the sewer.

We have added an inflow/infiltration education section to our stormwater informational pamphlet. These pamphlets are sent out with the water bills to all the residents that are using Agawam's water system. In this pamphlet we will inform residents that stormwater connections to the sewer are improper because it burdens the Town with unnecessary costs in pumping and treating clean stormwater, and may cause SSO's in neighborhood streets. We will also refer to the city ordinance and inform property owners that the DPW is available to help aid in fixing these illegal connections.

The Sewer Department/Engineering Division continue to work together using our television equipment to inspect building sewers, sewer mains and drain lines for breaks and inflow. The Engineering Division is also working on mapping Agawam's stormwater system using GIS. The Town's drainage system has been essentially mapped on GIS and we continue to refine and add information as changes are discovered. If any inter-connections between the sewer and drainage systems are discovered during this investigation, they are dealt with in a prompt manner.

We continue to monitor the flow recordings from our wastewater pumping facilities and investigate any abnormalities for possible inflow/infiltration problems. We are looking into options with United Water for improving any existing faulty flow metering at our pump stations. This will better enable us to monitor the sewer system before, during and after storm events which will lead to improved data and assist in more accurately locating inflow/infiltration connections in the future.

Should you have any questions regarding these issues please phone me at 413-821-0623.

Very truly yours,

Christopher J. Golba, Superintendent
Dept. of Public Works

Cc: Michelle Chase, PE, Town Engineer
John Decker. Deputy Superintendent
Ralph Jagelavicius, United Water

Department of Public Works
The Town of Ludlow, Massachusetts

February 10, 2014

Mr. Joshua Schimmel
Director of Wastewater Operations
Springfield Water and Sewer Commission
P.O.Box 995
Springfield, MA. 01101-0995

Re: National Pollutant Discharge Elimination System
2013 Permit Information

Dear Mr. Schimmel:

We are responding to Springfield Water and Sewer Commission's annual request for information to support the Springfield Regional Wastewater Treatment Facility permit reporting requirements for the National Pollutant Discharge Elimination System Permit. It is our understanding the NPDES permit requires information from the Town of Ludlow identifying efforts conducted by the department to reduce infiltration and inflows to the regional sanitary sewer collection system during the 2013 calendar year. The Town of Ludlow has been and will continue to be proactive in our efforts to reduce and or eliminate excessive storm waters from entering the wastewater collection system. The recently completed sewer separation project in the Hubbard Street neighborhood has resulted in a major reduction in storm water from entering the collection system.

The DPW infrastructure maintenance program routinely replaces catch basin frames and grates and sewer manhole covers throughout the system to reduce inflow to the collection system. Also, the DPW routinely maintains the system by flushing and cleaning the sewer and storm drainage systems with our Camel vacuum equipped vehicle. The sewer system problem areas are monitored and television video data is recorded to evaluate line conditions. In addition, maintenance has included regularly scheduled root removal treatment in known problem areas.

The West Mass Development Corporation is in process of redeveloping the historic Ludlow Mills complex on State Street which includes the removal and abandonment of several private sewer lines which has reduced inflow and infiltration of storm and ground waters from the collection system. In addition, the public sewers within State Street have been improved in specific locations to serve the area. The Mills Redevelopment Project has a 20 year build out schedule.

Please do not hesitate to call if you require any additional information regarding our efforts to reduce infiltration and inflow to the collection system.

Sincerely,

Paul Dzubek

Paul Dzubek, PE
Director Public Works

Cc: Board of Public Works
K. Batista, Operations Supervisor

Town of Wilbraham
DEPARTMENT OF PUBLIC WORKS
240 Springfield Street
Wilbraham, Massachusetts 01095
(413) 596-2800 ext. 208

Edmond W. Miga, Jr., P.E.
Director of Public Works

January 29, 2014

Joshua Schimmel, Director of Wastewater Operations
Springfield Water and Sewer Commission
P. O. Box 995
Springfield, MA 01101-0995

Dear Mr. Schimmel:

The Wilbraham DPW has received your letter dated January 29, 2014 requesting documentation of "Efforts taken by the Town to reduce or eliminate excessive infiltration/inflow during the calendar year 2013."

Our efforts continue to include:

- Daily monitoring of flows in two (2) key locations in Town.
- Tracking rain events to measure impacts on the system.
- Water/sewer bill notice. See enclosed.
- Periodically camera lines that are suspect of I & I with Town owned equipment (Briar Cliff, Amy Lane, Tracy Drive, Wellfleet Drive, Sterling Drive and Hefferon Road.
- Smoke testing at the Academy and Oxford Drive.
- Emphasized the issue in the Town Report (see enclosed).
- Verbal communication with Plumbing Inspector to be aware and report and enforce connections he may find.
- Sealed manhole cover in roadway at two locations which were subject to flooding.

As you know, keeping our flows down has a financial incentive to reducing our bill. Hope that this documentation meets your requirements.

Sincerely,

Edmond W. Miga, Jr., P.E.
Director of Public Works

EWM/dd
Enclosure

WASTEWATER DIVISION

The Wilbraham Wastewater Department is an enterprise fund that generates revenue through consumption based semi-annual sewer billing. Most of the customers' sewer bill is calculated directly from their water meter reading. The sewer revenues are used to pay for the operation and maintenance of the wastewater collection system, capital improvements, and necessary wastewater treatment.

The Wastewater Division has a total of ten pumping stations that pump wastewater to the Springfield Regional Wastewater Treatment Plant located at Bondi's Island. We also assist other departments that have pump stations when they reach out for help. The Springfield Water and Sewer Commission sends the Town a sewer bill which is based on the Town's total annual flow and average concentration (Biochemical Oxygen Demand and Total Suspended Solids). Wilbraham pumped 132 million gallons of wastewater to Bondi's Island in FY 2013.

The two full time wastewater employees maintained ten pump stations which includes pump maintenance, assisting Springfield with sampling, building maintenance and flow recording. This year we also were able to purchase a new truck with hoist for the department. Staff responded to sewer breaks and blocks as well as a pump station repair. Staff also investigated illicit sanitary connections such as sump pumps. Residents who have connected their sump pump to the Town's sewer system are responsible for a considerable amount of burden on the collection system and pumping stations, which results in increased sewer rates.

If you're connected to the municipal sewer system, there are a number of things you can do to prevent problems from occurring in the Town sewer system and on your property. Do not connect sump pumps, storm drains or troughs of any kind into the system. Grease or oil should not be put into the drains. Allow grease or oil to cool before throwing it into the garbage. Don't build decks, sheds, or plant trees near or over sewer lines.

We are pleased to report that the rates have not changed since 2010

Residential Rate	$4.10 per 100 cubic feet
Minimum charge	$52.50
Maximum charge	$492.00
Flat Rate	$270.60
Commercial Rate	$5.00 per 100 cubic feet

Wastewater Employees
Richard Zamora, DPW Foreman/Technician
Daniel Gore

WATER DEPARTMENT

During 2013 the list of duties performed by the Water Division under the supervision of Michael Framarin, Water Superintendent included, but was not limited to: maintaining the four water booster stations, the 2.1 million gallon water tank and our corrosion control facility; three (3) water breaks were repaired, 14 new water service installations (8 of them in the Washington Heights sub-division), 85 fire hydrants were flushed and checked for proper drainage, two (2) fire hydrants were replaced, over 70 main line gate valves were cleaned and checked for

All bills due the Town of Wilbraham for Water and Sewer use are payable to the Town Collector within 30 days. All abatement/hardship requests must be submitted in writing within 30 days. Each sewer bill and water bill unpaid after 30 days will be assessed a separate penalty of $25.00 each and an interest of 14 percent per annum computed from the date the bill was mailed. Unpaid water bills after 30 days will also be subject to water shut off.

Unpaid bills, including late payment penalties in the previous calendar year, may be added to the real estate property tax in the form of a lien for the current year as provided for in Mass. General Laws, Chapter 40, Section 42A through 42F, inclusive.

If the title of the property changes, the name and address of the new owner should be given to the Public Works office in order that bills may be properly rendered. Bills are sent twice a year, once in November and once in May. If you have any questions or do not receive your Water or Sewer bill, contact the Public Works office at 596-2800 ext. 208.

FREQUENTLY ASKED QUESTIONS:

How much does a typical residential customer pay for one gallon of water?
Divide residential rate by 748 gallons.

How do I calculate my water bill:
Multiply usage (cubic feet) by rate and divide by 100 = $$

How do I calculate my sewer bill:
Multiply water usage by rate and divide by 100 = $$

How many gallons are in one hundred cubic feet of water?
There are 748 gallons in one hundred cubic feet of water.

A reminder to all residents that sump pumps connected to the sanitary sewer system are illegal. The additional flows increase our costs to Springfield, which is passed on to all residents connected to the sewer system.

TOWN OF WEST SPRINGFIELD

DEPARTMENT OF PUBLIC WORKS

26 CENTRAL STREET

SUITE 17

WEST SPRINGFIELD, MA 01089-2763

Monday - Friday
8:00 AM - 4:30 PM

Tel: (413) 263-3242
Fax: (413) 734-9745

Robert J. Colson
Director

James W. Lyons, P.E.
Town Engineer

Vincent DeSantis
Deputy Director of Operations

Jeffrey R. Auer
Deputy Director of Water

Michael Pattavina
Waste Management Coordinator

Cynthia Zarichak
Office Manager

February 12, 2014

Joshua D. Schimmel
Director of Wastewater Operations
Springfield Water and Sewer Commission
P.O. Box 995
Springfield, MA 01101-0995

RE: Reduction of Inflow and Infiltration to the West Springfield Sewer System

Dear Mr. Schimmel:

I am writing in response to your letter to Robert J. Colson in which you request a report documenting efforts by the Town of West Springfield to reduce or eliminate excessive inflow/infiltration. I am pleased to report that West Springfield has continued to make steady progress with projects that address this issue.

There were several active projects in 2013 that were aimed at reducing excessive inflow/infiltration to the West Springfield Sewer System.

In the spring of 2013, Tighe & Bond Engineers were performing Phase III of the I&I project in which infiltration was measured. Due to the lack of precipitation, groundwater did not stay elevated for a long period of time. The infiltration/flow isolation was stopped when groundwater dropped below satisfactory levels. The Town was able to isolate flow in sewershed 8, which consists of approximately 22,350 feet of pipe. Approximately 163,200 gpd/idm of infiltration was found within the sewershed. Flow isolation on remaining sewersheds will hopefully be completed in the spring of 2014. Once the Phase III work is finished, a report will be developed which recommends cost effective rehabilitation work and its associated cost.

Inflow work was conducted in the fall of 2013 and consisted of smoke testing and manhole inspections. Approximately 137,700 feet of sewer were smoke tested and approximately 150 manhole inspections were conducted during the 2013 smoke testing work. Smoke testing was conducted between September 9th and October 15th. Follow-up dye testing work was conducted on December 9th and December 12th of 2013 to confirm the connectivity of suspected inflow sources. A total of 18 suspect sources were dye tested. Manhole inspection reports from all phases of work have been uploaded to the Town's geodatabase totaling over 200 inspections. Field crews used a GPS to update locations of smoke tested and inspected manholes during the field work. The Town's sewer database was updated with data collected in the field. Updates included adjustment of sewer manhole locations, new sewer manholes and catchbasins, and attribute information such as pipe size/materials.

In the spring of 2013, the Town of West Springfield hired Kenyon Pipeline Inspection to perform sewer cleaning and video inspection of sewer lines. Defects in the sewer system were discovered on numerous streets.

In late summer of 2013, R.H. White, the town's contractor and West Springfield DPW personnel made repairs to the sewers where defects were found. The cost of repairs was approximately $60,000.00 and for the most part consisted of replacing sections of pipe that were cracked or broken. Repairs performed eliminated sources of inflow and infiltration on those streets.

It is the town's intention to continue to remove sources of infiltration and inflow to the sewers in West Springfield by developing capital improvement programs to remove the sources from the system.

Should you have any questions or comments, please feel free to contact me at (413) 263-3249.

Sincerely,

James W. Lyons

James W. Lyons, P.E.
Town Engineer

Cc: Robert J. Colson, DPW Director
File

CITY OF CHICOPEE
DEPARTMENT OF PUBLIC WORKS

Jeffrey A. Neece
Superintendent

Thomas Hamel
Project Supervisor

Thomas Shea
Chief Operator

March 4, 2014

Joshua Schimmel
Director of Wastewater Operations
SWSC
PO Box 995
Springfield, MA 01101

Re: Inflow & Infiltration Activity 2013

Dear Mr. Schimmel,

In response to your letter and in accordance with the NPDES permit issued to the SWSC the City of Chicopee submits this report of Infiltration and Inflow activities in 2013. This report is for the small area of the Chicopee collection system that flows to Springfield. This area of the collection system is completely separated with no known I/I issues.

The City of Chicopee will continue educate the public about separated sewers, sump pump connections and other illicit inflow sources currently in place for the NPDES Municipal Separate Storm Sewer System (MS4) program. The City will continue to collect I/I data through visual inspections during service call response work. The City will continue to map the calls for service on an annual basis which areas of the City of Chicopee need I/I attention.

If you have any further questions you can contact me at the number below.

Sincerely,

Thomas Shea

Thomas Shea
Chief Operator

Water Pollution Control
80 MEDINA STREET · CHICOPEE, MA 01013-1041 · TELEPHONE #(413) 594-3585 FAX# (413) 594-3588

East Longmeadow Report on I & I Activities

This document summarizes the Town of East Longmeadow's actions and review of closed-circuit television inspections of the Town's gravity sewer system that were performed by the Town of East Longmeadow during the winter and spring of 2013 and actions that took place during 2013.

The Town of East Longmeadow owns and maintains a sanitary sewer collection system that collects wastewater and discharges it to the Springfield Water and Sewer Commission's collection system. In 2007, the Town with the assistance of Tighe & Bond Engineers completed a continuous flow monitoring program. During the 2007 flow monitoring program, the Town's sewer system was divided into sub-basins, each consisting of approximately 20,000 linear feet of gravity sewer mains. Based upon flows during the observations period, infiltration rates were calculated, in gallons per day per inch-diameter mile (gpd/idm), for each of the sub-basins. The V2, V3, V5, V6 and V7 sub-basins, which are a tributary to the Vineland Avenue Pump Station, had the highest unit infiltration rates, each greater than 4000 gpd/idm.

In 2012, a flow isolation program was performed by EST Associates on the gravity sewers in the sub-basins where excessive infiltration was identified by the continuous flow monitoring, which was defined as areas with an infiltration rate greater than 4000 gpd/idm. The intent of the flow isolation program was to identify infiltration rates of individual sewer segments within these areas, and locate discrete sewer segments to be CCTV inspected.

Following the flow isolation program, CCTV inspections were performed by Mobile Robotics on all sewers that were identified with an infiltration rate greater than 11,000 gpd/idm and this was considered our Phase I program. Based upon these CCTV inspections, the Town implemented a rehabilitation program in early 2013 that consisted of cured-in-place lining (CIP) and testing and sealing (T&S) of sewer joints. During the construction phase, 4,149 linear feet of 8" and 10" sewer main was tested and sealed (at joints and service connections)($31,997.50) and 2,280 lineal feel of predominantly 8" sewer main had cured in place lining installed ($89,460.00).

The Town recently completed a CCTV inspection of a portion of the Phase II sewers (which are sewers with infiltration rates greater than 4,000 gpd/ipm but less than 11,000 gpd/ipm.) Approximately 4,740 linear feet of the Phase II study area has been completed, with anticipated completion of the remaining 4,760 linear feet to be completed during the Spring of 2014.